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A COST-REDUCTION STRATEGY FOR WEAPON SYSTEM ACQUISITION

John J. Cloos, *Project Leader*
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December 1990

Prepared for
Strategic Defense Initiative Organization

INSTITUTE FOR DEFENSE ANALYSES
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A proposal is presented for a cost-reduction strategy (CRS) that establishes a framework for systematically identifying, evaluating, and applying the various acquisition initiatives that are intended to lower weapon system costs. The CRS consists of a taxonomy of specific acquisition initiatives, their proposed timing by acquisition phase, suggested incentives, and the recommended process for implementation. This framework was primarily developed for the Strategic Defense Initiative Organization as a point of departure for tailoring a strategy to its individual acquisition programs. The CRS evolved, in part, from the initial Could Cost concept that was introduced in late 1987. This study examines each of the five model programs used by the Services to demonstrate and assess the Could Cost concept. The report includes a summary of the model program approaches, the results achieved, and the major lessons learned, which serve as the foundation for development of the CRS.

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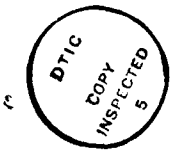
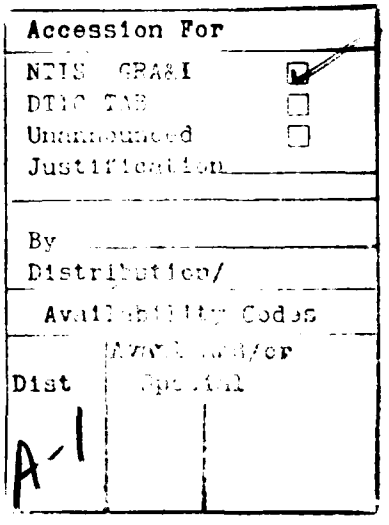
PREFACE

This paper was prepared by the Institute for Defense Analyses (IDA) for the Strategic Defense Initiative Organization, under contract MDA 903 89 C 0003, Task Order T-R2-597.19, issued 16 December 1988. The objective of the task was to assess the extent to which savings are possible through the application of cost-reduction techniques, and to help implement recommendations.

This work was reviewed by Karen W. Tyson and Karen J. Richter of IDA and by Robert Case, an IDA consultant.

We would like to express our appreciation to the many persons who contributed their valuable time and efforts to this study, particularly the focal points in each of the government and contractor program offices that we visited. We owe a special thanks to Max Westmoreland in the U.S. Army Materiel Command for his generous and insightful help.





EXECUTIVE SUMMARY

The purpose of this study was to develop cost-reduction strategies that could be applied to the strategic defense system programs under the management and oversight of the Strategic Defense Initiative Organization (SDIO). Affordability has long been an important consideration in the weapon system acquisition process. Recently, the expanding federal deficit and the intense competition for available government resources have made cost an even more essential criterion for deciding on the composition of the Defense Department's arsenal in terms of both types of weapons and quantities. Business as usual may no longer be acceptable as policy makers and managers alike look for new ways to cut costs.

In late 1987, the former Under Secretary of Defense (Acquisition), Dr. Robert Costello, introduced a new approach to reducing costs, which he referred to as "Could Cost." Subsequently, the military Services selected specific programs to demonstrate the feasibility of the concept. Dr. Costello believed that savings in the range of 20-30% of program costs could be achieved. SDIO subsequently became interested in the Could Cost concept as another way to lower program costs. In early 1989, SDIO initiated this study to consider the advisability of developing and applying a cost-reduction methodology similar to Could Cost to selected programs.

APPROACH

Our approach consisted of the following:

- Survey the available literature and attend relevant conferences to identify significant new efforts to cut costs both in government and industry.
- Review and assess the progress and methods of the Department of Defense (DoD) model programs in implementing Could Cost. This included reviewing available documentation and interviewing appropriate personnel in each of the government and contractor offices.
- Develop a strategy for reducing costs and review the major elements of the strategy with selected contractors and government personnel.

UNDERSTANDING THE PROCESS

What is Cost Reduction?

Cost reduction is the lowering of the price of resources on a given product or service. Cost reductions on existing commitments are typically referred to as actual or real savings and can be objectively and accurately measured as in the case of negotiated contract changes. Reductions on future commitments fall under the category of cost avoidance. Such savings can only be estimated and are difficult to track and validate. Although cost avoidance savings cannot be as objectively and accurately measured as actual savings, they still represent lower estimated costs than would have been attained otherwise.

Targeting the Process

Actions to reduce costs can be categorized by the process that they are designed to affect. The weapon system acquisition process can be viewed as three interrelated components. Requirements establish what needs to be done in terms of output. Conversion (e.g., manufacturing) transforms the input resources into the desired output. Finally, the business component forms the structure for the relationships between requirements and conversion (e.g., contract) to include input and output. Thus costs can change only when some element of the requirements, conversion, or business components changes.

Targeting Costs: The Value Added and Non-Value Added Identity Crisis

Value added costs represent activities that increase the utility of a product or service to the customer, i.e., improve its performance, quality, cost, or schedule. Non-value added costs, such as moving, storage, and inspection, do not enhance utility and can often be eliminated or greatly reduced without significant consequence. Initially, most cost-reduction activities focus on non-value added costs because they usually have a greater potential for savings. However, even value added activities can be made more efficient to reduce costs. Information systems now available in the defense industry generally do not identify costs by their relative value. Therefore, some type of process value analysis and attendant activity-based accounting structure should be developed to better target opportunities for savings.

It's All in the Timing

Timing is critical to the success of any cost-reduction process. Clearly, the maximum potential for savings is in the early stages of a program when decisions regarding requirements, design, materials, quantities, manufacturing processes, and test and evaluation are made. As a result, by milestone I, approximately 60% of the life-cycle costs are already committed. The percentage of cost commitment increases to 85% at milestone II and to 95% at milestone III. This results in potential savings of 40% at I, 15% at II, and 5% at III given the assumption that the basic requirements, technology, and manufacturing process will remain fundamentally the same throughout the program. These percentages represent averages that can vary by program due to type, relative maturity, stability, degree of technological advance, individual contractor efficiency, and competitive environment.

THE COULD COST MODEL PROGRAMS

Dr. Costello personnally encouraged development and application of the Could Cost concept, but the Office of the Secretary of Defense (OSD) and service staffs never fully embraced the effort. Their lack of support and guidance along with the resignation of Dr. Costello in the spring of 1989 eventually led to the demise of Could Cost.

Although the Could Cost program was never institutionalized, each Service selected model programs that were used to demonstrate the Could Cost concept. These programs were as follows: Army—Bradley Fighting Vehicle, Apache Helicopter, and the Anti-Armor Weapon System-Medium (AAWS-M); Navy—Trident D-5 Missile; and Air Force—B-2 Bomber. The approaches used to reduce costs in these programs varied by Service. The Army focused on specific contract reductions using Could Cost as one of many available acquisition techniques. The Navy and Air Force program offices adopted the "umbrella" approach for Could Cost, which encompassed every possible initiative designed to cut costs. The B-2 program office and the prime contractor, Northrop Corporation, also established an ongoing and successful Cost-Reduction Initiatives program, which has since become a part of each organization's culture.

Estimated savings provided by each of the model program offices varied according to the approach used, the maturity of the program, and the competitive environment. The B-2 and Trident programs claimed the largest savings with $6.2 billion and $2.2 billion, respectively. The Army reported savings of about $.5 million on the competitive AAWS-M, $15 million on the Bradley, and $6.7 million on the Apache helicopter. The

model programs, provided several important lessons that were used as the foundation for developing and applying future approaches to cost reduction.

A COST-REDUCTION STRATEGY TO MEET TODAY'S NEEDS

Current Environment: Need for Structure and Incentives

DoD has implemented a myriad of individual acquisition initiatives over the past several decades to reduce program costs. These initiatives are applied to weapon system programs by the government largely through requirements, by the contractor largely through conversion/manufacturing, and by both through the contractual process (business). We developed a taxonomy of cost-reduction initiatives based on the Could Cost model programs and a survey of the general literature. The value of each initiative stems from its capacity to extend the factors of effectiveness, efficiency, stability, innovation, and simplicity throughout the weapon system program and the related acquisition organizations.

We identified two major shortcomings in the application of current initiatives. First, there was no common thread to hold the suggested techniques together in the form of an overall strategy, methodology, or system to address all the alternatives and to collectively produce the maximum possible cost savings. Typically, the techniques are managed and controlled along functional lines without systematic integration. Secondly, adequate financial incentives were not made available within the contractual process to motivate contractors to cut costs.

Proposed Strategy

We propose a cost-reduction strategy (CRS) that applies various acquisition techniques, using appropriate incentives, that are tailored to a specific weapon system program without compromise to performance, quality, or schedule. CRS complements the Total Quality Management (TQM) process by applying many of the same underlying principles to lower costs on specific acquisition programs.

The recommended CRS revolves around the development and implementation of a specific program plan that results from three interrelated phases. The preparation phase consists largely of trying to incorporate the concept of continuous cost reduction into the organizational culture through training, education, and, most importantly, management commitment and support. The overall reduction process should be outlined to include a diagnostic approach for identifying potential techniques for the taxonomy and general guidelines for when and where the individual taxonomy items should be applied, i.e., the

government and contractor internal processes or the contractual process to include both the request for proposals (RFP) and the actual contract.

The second phase, planning, uses the framework from the preparation phase to develop and tailor a detailed implementation plan. Contractors are required to submit a proposed CRS in response to the RFP, which will also be used as a significant criterion for source selection.

The final phase, implementation, involves the placement of specific initiatives on contract. Other techniques involving the government and contractor internal processes are also monitored for execution. Implementation also includes the use of a cost-reduction clause in the prime contract and major subcontracts, which offers financial incentives for all cost saving recommendations.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The conclusions were based largely on our analysis of the model program experiences.

- The proposed CRS is a viable approach that fills an existing void in DoD's efforts to reduce costs because it is structured, can be applied systematically, and allows for consideration and integration of available techniques.
- The CRS complements and helps implement Total Quality Management into the organizational culture since both are predicated on many of the same principles.
- The opportunity for cost savings declines dramatically during the demonstration/validation and full scale development phases.
- A viable and ongoing cost-reduction process requires cultural changes in both government and contractor organizations that demand management commitment, guidance, and support.
- The cost-reduction process must involve the best people using multifunctional teams at key stages of the process.
- The use of appropriate incentives is absolutely critical to the cost-reduction process.
- The cost-reduction process itself must exemplify the factors that it has been designed to achieve, i.e., to be highly effective, efficient, stable, simple, and innovative.

- The cost-reduction process is most effective when responsibility and authority for management and approval largely reside within the program office.
- Incorporating a cost-reduction clause that encompasses all potential categories appears to be a useful and natural extension of the value engineering program.
- Contractor financial information systems do not provide sufficient data to distinguish between value added and non-value added costs.
- The Could Cost program largely failed because of the lack of top management involvement and support.

Recommendations

We segregated our recommendations by those generally intended for DoD-wide application and those that fall under the specific responsibility of the SDIO:

- DoD
  - Assess the results from the potential SDIO application of the CRS and consider further development and testing of the strategy.
  - Consider a policy that requires the submission of a cost-reduction plan as part of the documentation requirements for major program milestone decisions.
  - Continue efforts that expand the decision-making authority of the program manager.
  - Encourage acceleration of the evaluation and implementation phases of the value engineering program.
  - Incorporate into the Federal Acquisition Regulation (FAR) a provision for the cost-reduction clause.
  - Require notification by the program manager when implementation of the cost-reduction initiative is occurring after the recommended-not-later-than date.
  - Encourage enhancement of existing and development of new contractor accounting systems that provide more meaningful information, including value added and non-value added costs.
  - Continue to challenge individual requirements that do not add value to the final product by periodically using an independent team of multifunctional experts.
  - Encourage defense contractors who have sizeable commercial business bases to use individuals from that sector to participate in major cost-reduction efforts.

- Specific Recommendations for SDIO
  - Immediately implement the proposed CRS.
  - Plan and implement a training program for the CRS and TQM.
  - Assess the potential for applying the CRS to the major Service-managed space defense programs.

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I. INTRODUCTION

The increasing prices of Department of Defense (DoD) weapon systems and the intense competition for available government resources have made cost an even more essential consideration in the DoD acquisition process. Although cost-reduction techniques have been developed and applied, they have often taken a back seat to technical, schedule, and other mission-related requirements. However, today's environment—deficit budgets resulting in several trillion dollars in debt, greater awareness of expanding social problems, and apparent easing of international tensions among the superpowers—enables affordability to play a more prominent role in the DoD planning, programming and budgeting system (PPBS).

Conducting business as usual may no longer be acceptable as policy makers and managers alike look for new ways to cut costs. The commercial sector is leading the way in new approaches to become more efficient. Of course, this trend grew more out of a reaction to the economic realities of competition than an independent, self-initiated effort designed to make better use of resources. American businesses are feeling pressure to implement different and novel business practices in order to survive, and perhaps even prosper, in the face of accelerating worldwide competition. All facets of business are subject to change from management in corporate headquarters to the supervision on the factory floor and from the general manufacturing process to the specific automated production technology.

It now appears that the likelihood of declining budgets in real terms will force DoD to take new approaches to remain successful in its business of maintaining a credible defense. As part of this new "look," costs of individual weapon systems will have to be pared to achieve a reasonable return of value, in both real and perceived terms. The Could Cost concept was first developed as an overall cost-reduction approach for the DoD acquisition community to use in its efforts to reduce program costs. Its probable success, like many other innovative government projects, is significantly decreased by the embedded bureaucracy and the prevailing political constraints. Accordingly, any efforts for major change in the way DoD does business will likely be less extensive and occur more slowly than in the private sector. This paper examines the actual and potential effectiveness of the DoD Could Cost program from its inception through its applications in several major

weapon system programs. We then use the Could Cost experience as a point of departure for developing an integrated framework for application of specific cost-reduction strategies.

A. BACKGROUND

The former Under Secretary of Defense (Acquisition) from 1987 to 1989, Dr. Robert Costello, introduced the concept of Could Cost during his Senate confirmation hearings in November 1987. His intent was to change the way DoD manages its acquisition process in order to reduce weapon system costs by attempting to follow the best commercial practices. The use of a commercial model approach was to be expected given Dr. Costello's extensive background in industry. His experience in the automobile industry prior to joining DoD was particularly influential because it reflected the new approaches American car manufacturers adopted to compete with Japan.

The cornerstone of Could Cost for Dr. Costello was to be a new, closer, and more cooperative relationship between DoD and industry to minimize the non-value added work performed by a contractor. It was to be a partnership commitment to improve all aspects of the acquisition process and to produce the highest quality product.at the lowest cost. The "bottom line" of Could Cost would be the lowest cost weapon system after fundamentally changing the way DoD does business in today's defense marketplace.

Dr. Costello's initial purpose was to use Could Cost as a substitute for competition in a sole-source environment. Savings similar to those realized in a competitive environment could then be obtained. Dr. Costello believed that savings representing up to 30% of program costs were achievable. Although we were unable to determine specifically how this percentage was derived, we did identify a major contractor who claimed comparable savings in applying concepts similar to those included in the Could Cost philosophy.

In late 1987 Dr. Costello requested each of the military Services to implement the Could Cost methodology on selected model programs. The purpose was to demonstrate the viability of the concept and to serve as the foundation for its ultimate institutionalization throughout the military departments. Dr. Costello and the Services agreed on the following example programs: Army—Bradley Fighting Vehicle System; Navy—Trident (D-5) Missile Program; Air Force—B-2 Program. The Army also selected for it own purposes the Apache helicopter, the Advanced Antitank Weapon System-Medium (AAWS-M), and a government-owned, contractor-operated ammunition plant, the Lone Star plant.

In mid-1988, faced with increasing pressure from Congress to lower the costs of the Strategic Defense System (SDS), the Strategic Defense Initiative Office (SDIO) became interested in the Could Cost program as a possible approach to lower program costs. SDIO initiated this study in early 1989 to consider the advisability of applying a cost reduction methodology similar to Could Cost to designated SDS programs.

B. OBJECTIVE

The primary objective of this study was to develop a cost-reduction strategy that would enhance the affordability of selected elements of the SDS by maximizing the potential for cost savings. The task included the formulation of recommendations to incorporate the cost-savings methodologies into the acquisition process from the perspectives of both the government and industry (defense contractor).

C. APPROACH AND OUTLINE OF THE REPORT

Dr. Costello originally intended Could Cost to be the new overall approach to obtain high quality at the lowest cost. He described it as ". . . the ultimate extension and integration of other special acquisition techniques." As a result, we directed much of our research efforts on Could Cost development and implementation and specifically focused on the experiences of the model programs. We then used the lessons learned from their applications as the foundation to build a cost-reduction strategy that incorporated specific techniques, their recommended timing, and where they should be introduced into the acquisition process. More specifically, our approach incorporated the following:

- Survey the available literature and attend relevant conferences to identify significant new efforts to cut costs in both government and industry.
- Review and assess the progress and methods of the DoD model programs in implementing Could Cost. (This included reviewing available documentation and interviewing appropriate personnel in each of the government and contractor offices.)
- Develop a general cost-reduction strategy that could be readily tailored for specific program application.
- Review the proposed cost-reduction strategy with selected contractors and government personnel.

This paper reflects the results of our review of the Could Cost methodology, the development of a cost-reduction strategy, its application to SDS, and potential for use in other defense systems. Chapter II establishes the framework for analysis, including the

This paper reflects the results of our review of the Could Cost methodology, the development of a cost-reduction strategy, its application to SDS, and potential for use in other defense systems. Chapter II establishes the framework for analysis, including the evolution of the Could Cost concept, the distinction between value added and non-value added work and the development of an appropriate baseline to serve as a point of departure for estimating potential savings. Chapter III summarizes the experiences of the Services in implementing Could Cost, including their approaches, methods employed, and the claimed savings on each of the model programs. Chapter IV proposes a cost-reduction strategy that recommends a structure and process for applying specific initiatives. Chapter V describes how the strategy was tailored for potential SDIO application to the Brilliant Pebbles program. Chapter VI presents our conclusions and recommendations regarding the viability of the strategy and its potential use by SDIO in particular and DoD in general.

II. FRAMEWORK FOR ANALYSIS

The DoD acquisition process is a very complex, multi-billion-dollar business that can be characterized, in part, by a myriad of legal and regulatory controls, an entrenched government and industrial bureaucracy, and a reputation, at least perceived, for producing weapons systems that at times cost too much and have serious quality problems. This chapter describes the framework for analysis that we used in evaluating various cost-reduction programs that attempted to overcome these problems.

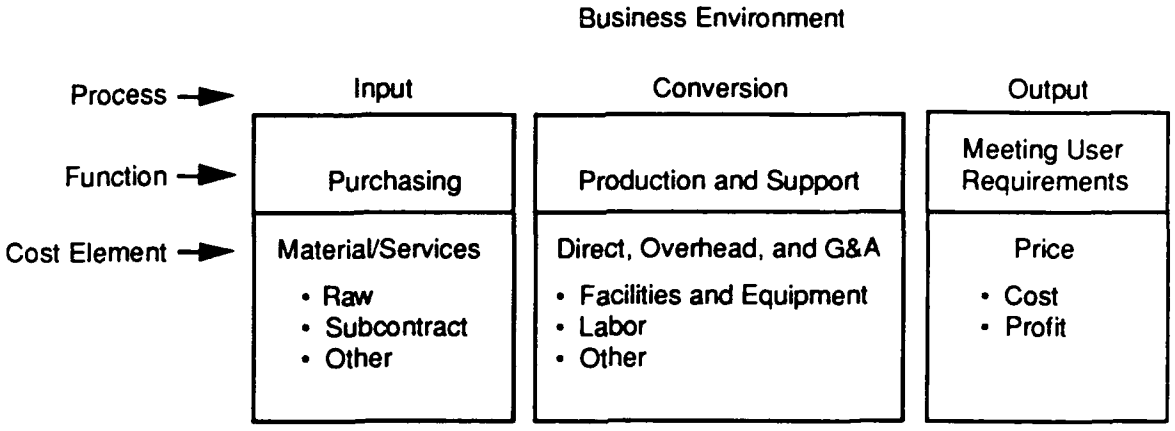
A. COST REDUCTION AND WEAPON SYSTEM COSTS

Costs represent the value of resources being used to generate a product in the form of either goods or services. Cost reduction is the lowering of these costs on existing and future commitments for a given product. Cost reductions on existing commitments such as contracts are typically referred to as actual or real savings. Such savings can be objectively and accurately measured as in the case of negotiated contract changes. Reductions on future commitments fall under the category of cost avoidance. Such savings can only be estimated and are often difficult to track and validate even after the future commitments have been realized. Although savings gained through cost avoidance cannot be as objectively and accurately measured as actual savings can, they still result in lower costs. Because initiatives to lower costs must be applied early in the weapon acquisition process to be most effective, the savings mix is much more heavily weighted to cost avoidance.

The general DoD acquisition process to convert resources to an end product is shown in Figure 1. The general process is divided into three separate but interrelated processes: input, conversion, and output. The major functions, of these processes are purchasing (input), production and support (conversion), and meeting user requirements (output).

The process can also be viewed by its progression through the acquisition life cycle represented by individual contracts covering each major acquisition phase or milestone, i.e., Concept Exploration (milestone 0), Demonstration/Validation (I), Full-Scale Development (II), and Production (III). The process starts with input from the purchase of raw or processed material that is typically either procured as part of a subcontract with

another firm or purchased outright. For service-type products, input could include subcontractor services.



Note: Separate process and contract for each phase (Concept Exploration, Demonstration/Validation, Full-Scale Development, and Production).

Figure 1. Process Cost Model For Weapon Systems

The second stage is the conversion phase where, in the case of manufacturing, raw material and subcontractor- or other company-provided materials are changed into the desired physical output. The primary conversion functions are production (including assembly) and support.

Costs are classified as direct, overhead (or indirect), and general and administrative expenses. These costs can be further subdivided into a number of different cost elements that more specifically identify the nature of the cost, e.g., manufacturing labor, engineering labor, fringe benefits, etc. The conversion stage culminates with delivery of requirements to a customer either in the form of a manufactured product or a particular service. Compensation for the output is the price paid by DoD that consists of contract costs and profit or fee.

Obviously, cost reductions can occur only by lowering the cost of resources used in one of these three process stages. An organization can choose to change the input process (to affect the quantity, type, and price of resource), the conversion process (e.g., equipment, labor), or the output process (by changing technical, schedule, or cost output requirements). For the weapon systems process, DoD identifies requirements, industry serves as the primary architect of the conversion process, and input is determined jointly through the interaction of product requirements and the conversion process. Finally, the

overall business structure that establishes the relationships among the three stages of the process is principally controlled by DoD through its acquisition strategy.

B. THE COULD COST PROGRAM: FROM START TO FINISH

The original intent of the Could Cost program was to improve each part of the weapon system process in order to achieve high quality and low costs. How did Dr. Costello and the supporting OSD staff plan to implement the new concept? What guidance and assistance were made available to enhance its potential for success? Where is Could Cost today? We try to answer these questions by describing the life cycle of the Could Cost program.

1. Guidance and Support: The Missing Links

Guidance and support from the Office of the Secretary of Defense (OSD) and the Services, so essential to the success of the Could Cost, were not sufficiently provided. The program was not embraced fully by the OSD, Navy, and Air Force staff, although some on the Army Materiel Command staff made a sincere effort to make the program work.

Early descriptions of the Could Cost process were largely limited to speeches, statements, and informal discussions by Dr. Costello. Although the three Services were tasked to demonstrate the Could Cost concept on selected model programs in late 1987, no formal guidance or direction was provided by OSD until May 3, 1988. At that time Dr. Costello signed a memorandum (Exhibit 1) that outlined in very broad terms his vision for Could Cost. The key features of the memorandum were:

- New acquisition technique
- Eliminate non-value added work
- Ultimate extension and integration of other special acquisition techniques
- Everything is open to examination and change
- Innovative thinking is required
- Partnership and participation with contractor
- Need incentives to motivate contractor performance
- Allows for different approaches for different situations.

Exhibit 1.

THE UNDER SECRETARY OF DEFENSE

WASHINGTON, DC 20301

3 MAY 1988

ACQUISITION

(P&L)P

MEMORANDUM FOR THE SECRETARIES OF THE MILITARY DEPARTMENTS
DIRECTORS OF THE DEFENSE AGENCIES

SUBJECT: Could Cost

Could cost is a new acquisition technique designed to achieve the best quality and cost for goods purchased. It seeks to create the special challenge that a commercial marketplace poses, i.e., what could the cost and quality of the product be if we fundamentally change the way we do business by eliminating non-value added work and concentrating on delivering the best quality product, on schedule, and at the lowest possible cost.

Could cost is the ultimate extension and integration of other special acquisition techniques such as total quality management, should cost, streamlining, and value engineering. Every Government specification and contract requirement (except those required by law) and every facet of the contractor's operations are open to critical examination and possible change. Innovative thinking, both in the business sense and in the technical sense, is required by both contractor and Government personnel to achieve substantial benefits to the bottom line.

The characteristics which most distinguish the could cost methodology are its comprehensive scope, up front partnership and participation with the contractor, and similarity to commercial practices. The contractor must join in an intensive effort to explore every possible avenue to maximize quality while minimizing cost. Incentives must be sought to motivate contractor participation and performance.

Could cost allows different approaches depending on such things as the stage of the particular program, ability to compete or to use multiyear procurement, and other factors. The current demonstration programs - Army's Bradley Fighting Vehicle and three others, Navy's D-5 Missile, and Air Force's Advanced Technology Bomber - are providing an invaluable experience base for expanding and institutionalizing the could cost program. I encourage you to select other suitable programs for could cost application. Within the next 45 days, I would appreciate being briefed on the progress of each demonstration program. Each of the Service's representatives should attend these briefings in order to cross feed ideas to the maximum extent possible. Bob Davis is the OSD coordinator and can be reached at 695-8355.

Your active support of the could cost strategy is appreciated.

These elements are important considerations in establishing a meaningful cost-reduction program. But, are they new? Probably not. Most experienced persons in the acquisition business had already seen these elements in one form or another over the years. The difficulty is not usually in identifying initiatives but in developing plans, methods, and procedures necessary for success in implementation and ongoing execution. While the memo added some needed formality to the Could Cost experiment, it did little in the way of defining the concept or specifying the OSD role in and structure for overseeing its development. This was unfortunate, particularly in the case of the element dealing with the "ultimate extension and integration of other special acquisition techniques," since there is a real need for a structured and integrated approach to cost reduction. Our recommended strategy in Chapter IV deals with this issue.

The memo also requested that the Services present status briefings on their demonstration programs. The three briefings were provided during the summer of 1988. We were able to find only one other specific forum used to discuss Could Cost, which was a one-day conference held in St. Louis, Missouri, in February 1989. The idea for the conference originated with the Army Aviation Systems Command, who was able to have the Defense Systems Management College (DSMC) serve as conference leader. The conference focused on presentations of the demonstration programs, which appeared to be an update to the briefings provided to Dr. Costello during the previous summer. No further detailed guidance on Could Cost implementation was provided by the responsible OSD staff members in attendance.

2. Could Cost Evolution: A Necessary Process

Because of the lack of OSD guidance, the individual Services were largely left to their own devices to develop and apply Could Cost. This promoted an environment for more Service creativity in developing Could Cost, but added considerable doubt that the project would proceed fully in the direction and at the same depth, pace, and resolve of purpose envisioned by Dr. Costello.

Could Cost quickly evolved from its initial role of being simply a surrogate for the competitive marketplace. The concept can now be described as an umbrella term for any method, technique, or tool that can be used to reduce program costs.

3. Current Status and Utility

It is extremely difficult to break down the barriers and implement major change in any organization, and large organizations are particularly inflexible. DoD, with its

tremendous size and diversity combined with the relative autonomy of the Services, is particularly resilient to change it does not fully support. The Could Cost program is an excellent example of the bureaucracy's capability to resist this kind of change. The reasons for the lack of support within DoD vary. The general consensus among OSD and the Services appeared to be, as we alluded to earlier, that Could Cost was not really new. It is something any good program management office would do. The Services did not need another formal program that itself was perceived as being non-value added. This perception, however, was not shared by some individuals within the Army who had a more specific vision for Could Cost. This topic will be covered in conjunction with our review of the model programs in Chapter III.

Could Cost never succeeded in being institutionalized at either the OSD or Service levels. The Could Cost philosophy required two important conditions before it could be embedded in the DoD structure. First, the senior acquisition leaders and managers in both DoD and the defense industry must recognize the need for a dramatic change in the culture of their business. In this context, "culture" refers to the shared values, beliefs, and norms that characterize the way an organization operates. In the new manufacturing vernacular, the defense-industrial complex needs to be "world-class" (i.e., producing high-quality products at low costs in a manner that is responsive to and consistent with customer needs). Secondly, there must be commitment to change at all levels of the organization. Neither of these conditions was satisfied either within OSD or the Services. As a result, Could Cost never firmly took hold as a DoD-wide program and subsequently disappeared for all practical purposes with the resignation of Dr. Costello in the spring of 1989.

Even the Army, the strongest proponent of the Could Cost philosophy, has elected not to institutionalize it as a major program. Could Cost will simply be one of the many acquisition tools that a program manager can voluntarily apply. The Army has already shifted away from Could Cost and is now pursuing a contractor certification program as its primary strategy for achieving high-quality, low-cost weapon systems [1]. The certification process (similar in concept to the cost/schedule control systems criteria (C/SCSC) certification process) involves the government attesting that the designated contractor's organization, management, operational processes, etc., meet an established standard for manufacturing excellence. Such certification will reduce the need for government oversight in such non-value added activities as inspections, audits, program reviews, and reporting.

Although Could Cost is not a widely used program or term anymore, many of its underlying principles are still relevant and important. We prefer to use the term Cost

Reduction Strategy to describe the various approaches and techniques available to lower costs because it accurately summarizes the common underlying objective.

C. VALUE ADDED AND NON-VALUE ADDED COSTS

All too often, managers focus on managing those activities that are easily measurable and thus more understandable. As a result, many functions that are not susceptible to quick and simple measurement do not receive the necessary management attention. Non-value added work and its related causes and effects, particularly in the overhead segment of the business base, are typically not well understood and managed.

The concept of value and non-value added work is crucial to cost reduction as it provides the practitioners with a framework to begin identifying and prioritizing the needed changes. Simply stated, value added work to some degree increases the utility of a product or service; non-value does not. Clearly, non-value effort is associated with work and costs that you want to avoid. But is it really so simple? We think not. What is utility and can it not be defined in a number of different ways? Who determines utility and to whom is it useful? Are there varying degrees of value? Can an activity entail both value and non-value added elements at some common level of detail? What is the impact of risk?

Our purpose in this section is to describe the various facets of the value versus non-value added identity problem that may help in analyzing particular situations. While there are general principles that can guide decision making, each situation must be considered on its own merits. References [2] and [3] provide the reader with excellent background material on the non-value added concept.

1. Definition: In the Eyes of the Beholder

Could Cost, as well as many of the current cost-improvement initiatives found in industry, has been primarily directed towards the elimination or reduction of non-value added costs. Non-value added costs represent activities, associated with a product or service that do not increase its utility, i.e., improve its essential properties that consist of performance, quality, distribution, cost, and schedule. Non-value added activities, such as moving (at the plant site), storage, and rework can often be eliminated or greatly reduced without significant consequence. From a financial perspective, it should be viewed as any activity whose cost exceeds the benefit derived.

Theoretically, value and non-value added costs are direct opposites but, in practice, the real distinction is much less clear. The question of value must be considered not only

from the perspective of the producer (supply side) but also from the perspective of the customer (demand side) as well. In the commercial world, the value determination process is completed routinely in the competitive marketplace. A perfectly free market where buyers and sellers agree to an exchange transaction ultimately provides the most objective forum for distinguishing between value and non-value added work. Value is what the customer is willing to pay for. Presumably, firms with significant non-value added costs would have to lower these non-essential costs to compete or be driven from the market.

In its commercial business, industry typically uses the customer (non-government) requirements as the primary source for gauging value. If any aspect of the product meets a customer need, it generally is considered to be value added. In this instance, the customer is clearly the authoritative voice. However, in the case of government business, industry tends to be much more critical of what they perceive as non-value added customer requirements and the implementing acquisition process. Here, the tendency of the contractors is to segregate value and non-value added work based more on their own views and less on the customer's stated needs. For example, contractors often criticize the value of C/SCSC and its related reporting requirements although the DoD has consistently asserted its need and mandated its use.

It appears industry may be more judgmental in assessing DoD requirements because the government also controls much of the existing acquisition process in such key areas as determining the need for competition, specifying the type of contract to be used and prescribing profit policy. This contrasts markedly with the much broader freedom of exchange and greater opportunity for profits that the commercial markets provide.

Another useful construct is to consider the two-customer dimension in the DoD acquisition process. The separate buying and using organizations are only loosely tied together. These customers have different views on value because their functions are different. The buying command focuses on purchasing and its related oversight role, while the using command typically emphasizes product performance and safety. The absence of a strong integrating force allows customers to follow their own paths, which may eventually lead to non-value added requirements. This structure contrasts with the commercial sector, where the buying and using customers usually work directly and closely with the same boss.

One other aspect about the dynamic nature of value is worth noting, particularly in demonstrating the need for continuous process review and improvement. Categorizing value and non-value added is affected by a multitude of factors, including changes in

technology, automation, and customer demand. As a result, value added work can also become non-value added when it fulfills its original purpose. For example, a new performance measurement system may be needed to gather information for quality improvement. Such a system would initially be categorized as value-added if improvements in quality were made, and if the benefits of improvement were greater than the attendant costs of implementation. However, the costs of maintaining the system may eventually render it to be non-value added when the benefit of potential increases in quality fall below the costs to administer the system.

2. Risk and Value: Managing a Complex Problem

Risk is the probability that a selected course of action will produce an outcome that is different than what is expected or desired. For the purposes of this study, we have divided risk into two categories, real and perceived. Real risk refers to the possibility that technical, schedule, and cost requirements may not be met. Real risk reduction deals with both value-added (the predominant element) and non-value added work and usually can be accommodated in a cost/benefit analysis. Real risk depends on such factors as the availability and maturity of the technology, whether it be product- or manufacturing-related, the reasonableness of requirements, and the availability of necessary labor skills and expertise.

Perceived risk mainly deals with the attitudes and viewpoints of Congress, the public, the defense industry, and government management that could adversely affect the program and the participants. This risk is usually alleviated through non-value added work involving such actions as oversight (audits, inspections, visits, reports), justification (documentation, reviews), and short-term-results orientation (normally tied to management tenure) at the expense of long-term results. We recognize that executives and managers need information about the product and the related processes to ensure their continued success. There is some minimum level of management and oversight required where these kinds of activities are necessary to reduce real risk to an acceptable level. Beyond this point, however, they lose their cost effectiveness and become non-value added costs.

One of the difficulties associated with perceived risk lies primarily on the benefit side where there is arguably some value in having external parties look favorably upon a program. A well-regarded program is more likely to receive higher priority, better funding, and more flexibility in advancing technical and schedule objectives whether it be in government or industry. How much of this effort is value or non-value added is highly subjective. In some respects, it is similar to the marketing or sales function in the

commercial sector. However, most of the activities taken to reduce perceived risk are non-value added and can be reduced or eliminated.

The DoD acquisition process is a much less perfect system for identifying and measuring value than its commercial counterpart. The procurement process is a mixture of competition, albeit limited, and sole-source procurement. This process is further complicated by public accountability, the political process, and the individual motivations and interests of government personnel in both the military and civilian sectors. In the personnel area, avoiding failure, whether real or perceived, is frequently considered to be more important than achieving higher degrees of success. The system tends to reward varying success levels (in a broad range) within acquisition management in a relatively equal manner. On the other hand, widespread knowledge of significant failure (real or perceived) can be treated harshly by Congress, public opinion, and even internal government management. The situation is exacerbated by the fact that problems in major acquisition programs can easily be exaggerated by those who do not understand the process or who are simply acting in their own self interests. These conditions often create an environment where perceived risk is high, and risk aversion and its associated non-value added costs become an important objective for DoD decision makers.

Risk assessment has important ramifications for the weapon system acquisition process. The allowance that must be made to mitigate risk is to some degree dependent on the overall importance of the item in terms of consequences for a particular organization. The more important an item is to the continued existence of the organization, the greater the effort to reduce the risk of not achieving the desired results. The possible consequences of eliminating activities must be carefully weighed. For example, extensive testing and program reviews are typically classified as non-value added activities that can be reduced or eliminated. However, in the case of an important strategic program, reliability in technical performance may be absolutely critical because of the nature of its mission.

Additional inspections and testing may be warranted to ensure the necessary reliability. The same degree of reliability may not be nearly as important in a tactical program. Clearly, the consequences for the majority of commercial products do not have the potential serious damages associated with failure of military systems in an operational environment.

Other factors affecting risk include program maturity, the criticality of the product being manufactured and the type of contract, which, in effect, allocates risk between the government and the contractor. A very important and essential element in risk analysis is

the identification and, if possible, the quantification of the acceptable level of real risk for each significant element. Once determined, the results should be communicated as early as possible to those in the review process to enhance understanding of the present program and to facilitate future assessments against an agreed upon baseline.

Table 1 contains some general guidelines that summarize the above discussion on the relationship of value added costs, non-value added costs, and risk.

Table 1. Identifying Value and Non-Value Added Activities

	Value Added	Non-Value Added
If activities are directed at reducing real risk from unacceptable to acceptable levels	X	
If activities are directed at reducing real risk that is already at an acceptable level		X
If activities involve reducing perceived risk		X

3. Non-Value Added Costs: Dealing With an Identity Crisis

We have already described some of the difficulty associated with classifying value and non-value added work. The context for segregation is often the attendant costs that arise from non-value added work. Do present accounting systems help in the collection and measurement of such costs? Unfortunately, the answer is that they do not help very much [4].

Cost accounting today measures internal resource consumption by cost element (material, labor, and overhead) and by cost center (typically a functional unit). The resulting costs are either assigned to products or projects directly (readily identifiable) or allocated to common bases that presumably have a reasonable cause and effect relationship. These allocation methods use drivers to assign costs to products. The problem, however, is that most of the so-called drivers used today, such as direct labor, machine hours, and material costs, are volume-oriented and often do not reflect the relevant cause and effect relationship. As such, these drivers do not recognize the great diversity of activities that constitute indirect costs or overhead. This knowledge is critical since defense industry

overhead continues to increase and now represents almost 50% of the contract cost. Accounting systems also provide data to complete other cost analysis tasks such as fixed/variable analysis, standard costing, and budgeting.

However, the general systems in use today do not account for costs by whether they add value or not. Most companies account for some types of non-value added costs (such as scrap and rework, engineering changes, warranties and service centers) through their cost element and cost center structure; however, the present accounting strrcutre; however, structure does not identify any of the work activities that result in these non-value added costs (for example, the unnecessary movement and storage of inventory, preparation and distribution of unnecessary reports, and special processing procedures used throughout the plant).

This lack of non-value added cost identification is particularly important in the overhead area where cost centers and cost elements provide little information on the cost's contribution (value and non-value added) to the end product of the business. For example, how can the relative value of the purchasing department be assessed from current accounting information that focuses on cost elements? What is needed is a work-task-oriented breakdown structure that reflects the kinds of action being performed and can be analyzed to determine value.

Many modern accounting professionals have been criticizing cost accounting for its failure to reasonably portray product costs in the new manufacturing environment. IDA sponsored a conference on cost/performance measurement in mid-1989 that was attended by leaders from industry (largely defense), academia, major accounting firms, professional associations, and the government (largely DoD) [5]. The principal finding of the conference was that "today's cost measurement systems do not identify all relevant costs or provide reasonably accurate and timely information to improve the process or to make necessary strategic and tactical decisions." An apparent consensus for a recommended solution revolves around Activity Based Accounting (ABA) [6].

Activities represent the essential and significant work of an organizational unit toward the production and delivery of goods and services. A key feature of the proposed ABA system is the identification of non-value added costs associated with activities. The division of functions into activities provides the basic information necessary to identify and analyze non-value added work. The next step is the identification of the appropriate cost drivers, representing the underlying causes for the non-value added work, that must be affected to achieve cost reduction.

To date ABA has only been tested on a limited basis within several different companies. There have not been any company-wide applications. IDA also sponsored a conference in July 1990 entitled "The Workshop on Advanced Cost Management" [7]. As part of that workshop, three defense companies and their related Defense Contract Audit Agency (DCAA) organizations gave presentations on their experience in implementing ABC systems on a pilot project basis.

Given the likely continued absence of needed accounting data, any organization seriously pursuing a cost-reduction strategy should develop a reasonable, albeit macro, proxy for ABA for the contracted work. Without specific information regarding non-value added costs and attendant cost drivers, it would be very difficult to continuously promote their elimination in a timely manner.

4. Cost Reduction: Constant Improvement of the Entire Process

One-time cost-reduction efforts are typical in both government and industry. Although such efforts are useful in cutting costs, they generally do not provide the impetus to substantively change the overall process on a repetitive basis. Cost reduction is often a reaction to reduced revenues. A system of continuous cost improvement would obviate the need for many of the special cost-reduction efforts because the organization would already be performing at a high level of efficiency and effectiveness.

The cost-reduction process should involve every activity within an organization that consumes resources and hence adds cost to the final product. Of course, the main focus for cost reduction initially will be on the non-value because it is likely to have the largest potential for savings. However, improved efficiency and effectiveness in value added activities will also lead to cost decreases. The process also affects all the cost elements whose individual relative importance vary by company. In general, the greatest opportunity for savings probably resides in the overhead area since it is responsible for an increasing share of a company's controllable costs. Overhead, including general and administrative expenses, now accounts for almost 50% of defense contract costs. Balut and McCullough [8] project that if current trends continue, overhead may account for almost two thirds of the business base for defense aircraft manufacturers over the next 30 years.

Until recently, most government and contractor efforts to control and reduce costs centered on direct labor, usually the smallest in dollar magnitude of the three major cost elements. At times people incorrectly assume that lower direct labor costs automatically

translate into lower overhead costs (over and above the related costs for direct labor personnel benefits included in the overhead account). Overhead costs will be reduced only if the overhead activity that causes costs to be incurred is reduced or eliminated. Without that, the same total indirect costs in a one-product plant simply get allocated over a smaller direct labor base. In a multi-product plant, some of the indirect costs would simply migrate to other products whose allocation bases remain unchanged. In either case, total plant overhead costs remain unchanged.

In general, companies still do not have an adequate understanding of overhead activities and their impact on product and project costs. Consequently, efforts to reduce overhead are frequently effected through straight percentage reductions against a common base, which do not require a thorough understanding and analysis of organizational requirements.

The cost baseline for most manufacturing companies typically has been standard costs. These costs represent a planned level of expected costs given a normal volume of business and efficient performance. Variances from standard are computed and analyzed to determine and understand the reason for the variance. In an environment where you are attempting to reduce costs, the focus should be on what can be done to immediately improve organizational performance. Timely improvements would best evolve from current actual experience as the baseline rather than a historical predetermined standard. Use of immediate feedback avoids a potential major problem with standard costs that may already have some historical inefficiencies built into them. Feedback helps foster an environment of continuous process improvement where the goal always is to do better than the most recent actual costs the next time the action is performed.

Finally, cost reduction in the acquisition of weapon systems must at least involve all the primary organizations (and their personnel) in the acquisition process, i.e., the government program office, the prime contractor(s), major subcontractors, and major suppliers. Lack of leadership, management, support, and involvement in any of the mainstream units will have a negative cost impact.

D. POTENTIAL FOR COST SAVINGS

1. It's All in the Timing

Timing is critical to the successful selection and application of the various cost-reduction techniques, and can easily make the difference between success and failure. The cost effectiveness of any given technique will usually and significantly vary according to

the timetable that it is introduced and applied. Generally, the earlier a technique is applied, the greater the opportunity for savings. If a technique is used prematurely, there will likely be some non-value added costs but the entire opportunity for savings is still available. Conversely, when a technique is applied too late, you incur both the non-value added cost and the foregone savings opportunity.

2. Costs: Commitment and Expenditures

In general terms, how much could a program save if it instituted a total cost reduction program. The typical weapon system has a total acquisition cycle of about twenty years. The principal stages and estimated average length are Concept Exploration (milestone 0), 2-4 years; Demonstration/Validation (milestone I), 3-5 years; Full-Scale Development (milestone II), 4-6 years; and Production (milestone III), 8-10 years. Each of these stages experiences significant variations in terms of technical work accomplished and financial resources used.

One of the objectives in our analysis was to establish a baseline that could serve as a rough estimate and point of departure for estimating the average opportunity for cost savings. We recognized that any such standard would be limited in its utility because of the innate difficulty in estimating the amount of future costs that are already locked in as the result of past program decisions and because of the great degree of variability and uncertainty among programs. At the same time, however, we decided that it would still be helpful to identify a conceptual tool that would provide some insights into the long-term effects of early program decisions.

We adapted the Blanchard and Fabrycky [9] framework to help estimate the potential for savings. They use the life-cycle cost trend process to emphasize the importance of up-front decisions in determining cost outcomes. Cost commitment refers to the estimated amount of total costs, both prior and future, that are determined by actions and decisions as of a particular point of time. Requirements, whether they be technical, schedule, or cost, are largely determined during the first two milestones. During these stages, product design, the required materials and the manufacturing and support processes are basically established, and they drive life-cycle costs. Thus, it is not surprising that the percentage of life-cycle cost commitment by the beginning of milestone I has been estimated at about 60%; milestone II, 85%; and milestone III, 95%. These relationships are illustrated in Figure 2 on the cost commitment curve.

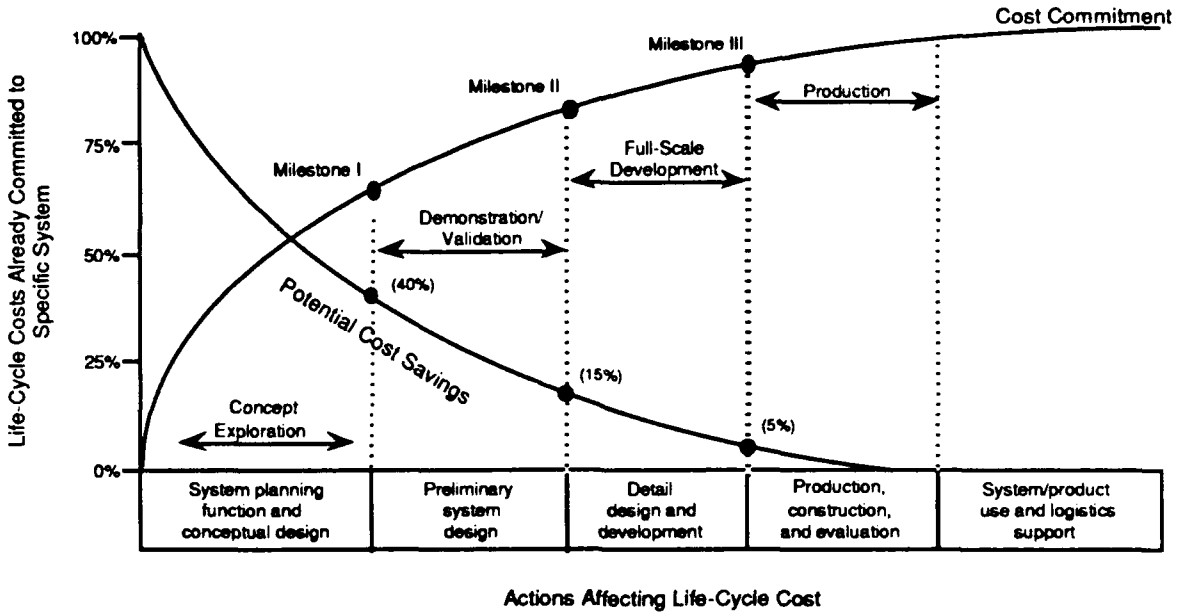


Figure 2. Flexibility of Cost Reduction

The unstated but apparently implicit assumption in the curve is that the fundamental requirements, technology, and manufacturing capabilities will remain basically the same throughout the program. The introduction of major changes in any of these elements significantly alters the cost commitment curve. Furthermore, the percentage of cost commitment for any single program would likely vary from this average for a large number of reasons. Such reasons include the type of program, its relative maturity, and the stability of its requirements, design, and schedule. Quantities, advances in technology, the efficiency of individual contractors, government versus commercial work, and the competitive environment also contribute to levels of cost commitment. Each program must develop its own unique cost commitment estimate or curve based on the best projection of all the variables.

The concept of cost commitment must be distinguished from expenditures (the cash outflow of funds) to pay for a product. Expenditures represent sunk costs, while cost commitment refers to future costs resulting from much earlier decisions. As would be expected, the majority of expenditures for a program occur during Production. Full-Scale Development is the second largest, Demonstration/Validation, third, and finally, Concept Exploration. Typically, cumulative program life-cycle expenditures may be about 1% at milestone I, 5% at II, and 20% at III. The one major exception for expenditures affecting

savings occurs when a program is terminated early, which requires expenditures and any termination liability to determine program costs.

3. Savings: The Other Side of the Coin

As a program matures, life-cycle costs become increasingly locked in. Thus, the opportunity for savings primarily relates to costs already committed and not to expenditures. It is generally the inverse of the cost commitment curve except it is assumed to include multiyear procurement. We believe the original commitment curve implies the use of multiyear strategy because the industrial sector would likely plan for a relatively stable output predicated on reasonably forecasted demand. This results in estimated potential savings at milestone I at 40%, II at 15%, and III at 5%, as shown in the potential savings curve in Figure 2. However, just as cost commitment varies by program, potential savings vary as well.

III. MODEL PROGRAM IMPLEMENTATION

"Hindsight is always 20/20" is a common expression used in assessing historical approaches and results. It is particularly relevant to our review of the Could Cost model programs. Most program offices in both DoD and industry have more work to do than time available. Any new program or initiative typically adds to the work backlog and is seldom accompanied by any increase in staff. Given the little advance notice, minimal guidance, and little staff support, followed by the resignation of the only senior proponent of Could Cost in DoD, the model programs performed extremely well. Our purpose in reviewing the Could Cost applications is not to be critical of their performance, but rather to learn from their experiences to improve future cost reduction performance on all programs.

This chapter describes each of the Services' approaches to Could Cost, the specific results for each of the model programs and a lessons learned summary from their composite experiences. In reviewing the model programs, our emphasis was on the cost-reduction techniques employed, their specific timing, claimed savings, and recommendations to improve future applications of Could Cost. Our ability to analyze and compare the performance of the model programs was very limited. The Services and individual programs employed different approaches, used different estimating techniques to measure savings, and generally could not provide us with detailed tracking and documentation for all the specific recommendations. Given the diversity and general shortage of specific information, we elected to classify our comments on each of the model programs as observations rather than as analyses.

The most difficult area to evaluate was the validity and accuracy of many of the claimed savings. Data provided to us on estimates were in various stages of development ranging from completed actions to projections involving future contracting negotiations. There was also no requirement from OSD to update the estimate after the status briefings to Dr. Costello in the summer of 1988. In addition, largely due to time and resource constraints, we did not review any of the procedures or supporting documentation used to formulate the estimates. Hence, we accepted the program office estimates of savings at face value.

One other qualification about the reduction techniques and related savings should be noted. The Navy model program included actions and attendant savings taken prior to the introduction of Could Cost. Although such reductions cannot be directly attributed to Dr. Costello's initiative, the techniques that were applied fall under the broad umbrella of Could Cost as it evolved in the Services.

A. MODEL PROGRAMS: STRATEGIES AND APPROACHES

The limited OSD involvement in providing Could Cost direction and oversight allowed the Services much latitude in its application to the designated model programs. Even within the military departments, there was generally limited guidance and oversight by the cognizant headquarters and command staffs. Accordingly, the responsible program offices exercised significant influence and control over implementation. As a result we found major differences among the Services in their Could Cost approaches and techniques, in their acceptance and support of Could Cost, and in their efforts to institutionalize the program.

To gain first-hand knowledge, we visited each of the government program offices for all the model programs and the contractor offices. Table 2 summarizes the major approaches employed by each of the model programs.

Table 2. Approaches Used in the Model Programs

Service	Program	Milestone	Approach
Army	Bradley Fighting Vehicle	III: 1/80	Facility-wide with FMC using business agreement
	Apache Helicopter	III: 3/82	Contract-specific with McDonnell Douglas using business agreement
	AAWS-M		RFP with source selection and contract-specific with TI/Martin Team
Navy	Trident Missile	III: 4/87	Umbrella approach using special team and normal contracting procedures
Air Force	B-2 Aircraft	II: 11/81	Umbrella approach using results from special team study and institutionalizing an ongoing cost-reduction process

The Army chose to apply Could Cost as part of the specific contractual process with each of its designated programs' prime contractors. The approach was directed at non-value added government requirements and contractor inefficiencies. Other cost initiatives such as Should Cost and Value Engineering were considered separately. The Navy formed a special team just for the Could Cost demonstration using the "umbrella approach" (anything and everything that can be construed as cost savings). The Air Force did not initiate any new activity for Could Cost but rather used the work of an already planned team review of the entire B-2 program. The results from the team's umbrella approach were used as the Could Cost demonstration. The B-2 program also implemented an ongoing cost-reduction initiative process that was related but not directly attributable to Could Cost.

B. THE ARMY EXPERIENCE

The primary objective of the Army in implementing Could Cost was to reduce or eliminate non-value added contract costs in two areas [10]. First, contract costs could be reduced by removing government requirements that provide no real value to the Army. Secondly, contract costs could also be lowered by doing away with inefficient contractor operations. The Army felt that in many instances the contractors are not sufficiently motivated to cut costs. Profit and fees are related and to a large extent based upon projected costs. A higher cost basis for negotiation can translate into higher profits. Even in a competitive environment, the contractor may not sufficiently challenge government requirements and may even retain internal inefficiencies that are not likely to affect the source selection outcome.

How are contractors motivated to reduce costs? The general Army approach was to provide financial incentives in the contractual process. For contracts already in place, agreements were to be developed to establish Could Cost processing and shared savings between the government and contractors. In the case of contracts not yet awarded, Could Cost would be included in the request for proposals (RFP) and used in the source selection process.

The Army selected the Bradley Fighting Vehicle Systems (FVS) as their model program to demonstrate the application of the Could Cost approach to Dr. Costello. The Army was interested in assessing the possible institutionalization of the Could Cost concept, which the Army believed to have real potential to reduce costs. As part of its initiative, the Army selected three additional candidates to obtain a broader assessment of Could Cost applications. Selection was designed to achieve different types of programs, varying maturity levels in the acquisition life cycle, different competitive environments, and

major production efforts (at least $150 million in annual production contracts). The three programs were the Apache helicopter (AH-64), the Advanced Antitank Weapon System-Medium (AAWS-M) and an Army Ammunition Plant (AAP), the Lone Star Plant, which is a government-owned, contractor-operated (GOCO) facility.

The Could Cost results from two of these programs are summarized below. We did not review the AAP application because it almost exclusively dealt with contractor support services (e.g., grounds maintenance, janitorial services) rather than the direct operation of a production facility to manufacture weapon systems.

1. Bradley Fighting Vehicle

The Bradley FVS consists of the Infantry Fighting Vehicle (IFV) and the Cavalry Fighting Vehicle (CFV) [11]. The IFV and CFV are fully tracked, lightly armored fighting vehicles that have cross-country mobility and mounted firepower to support ground units. The primary armament consists of an externally powered, 25mm automatic gun and a TOW (tube-launched, optically-tracked, wire-guided) missile launcher and a 7.62mm machine-gun. Both vehicles are amphibious and air transportable, and can serve as companion vehicles to the M1 tank.

The prime contractor for the Bradley is the FMC Corporation located in San Jose, California. The Hughes Aircraft Company through its Missile Division plant in Tucson, Arizona, manufactures the TOW-2 missile. McDonnell Douglas Helicopter Corporation in Mesa, Arizona, is responsible for gun production. Program management responsibility within the Army is assigned to the Bradley Fighting Vehicle Systems Project Office, an element of the U.S. Army Tank-Automotive Command (TACOM), located in Warren, Michigan.

The systems have been in sole-source production since February 1980. All major production contracts are currently firm fixed price. Total planned procurement quantity is 8,464 with annual buys now planned at 600 from FY 90 through FY 94 and ending with 287 in FY 95. The budget for each of the 600 annual buys ranges between $658 million and $783 million in then-year dollars. Total acquisition cost is estimated at about $12.6 billion. The budget and quantity information was extracted from the December 31, 1989, Selected Acquisition Report (SAR). Since the preparation of the SAR in early 1990, the planned buy was being reviewed with the high probability that there would be significant reductions in future purchases.

a. Application of Could Cost

The FMC Corporation, Ground Systems Division, Defense Systems Group, volunteered to participate in the Could Cost program. FMC's approach, which began in early 1988, was a facility-wide application involving both direct and indirect costs. The FMC leadership involved in the initial effort were enthusiastic and aggressive. During the early stages, FMC held a meeting involving approximately 400 managers and supervisors to brainstorm possible Could Cost ideas. The new program was also strongly supported by TACOM management. TACOM assigned a contracts manager as the Could Cost focal point, and FMC selected the Manager of Contract Compliance and Administration who also had a contracts background.

All recommendations for cost reduction, including estimated savings, were to be submitted by FMC to TACOM for screening. Evaluations within TACOM were performed by the functional divisions and project managers responsible for the effort recommended by FMC. After initial screening FMC was advised which recommendations were approved, disapproved, and still under consideration. Approved recommendations were to be followed-up with detailed proposals for contract implementation.

The intended framework for the Could Cost process was to be established in a business agreement between FMC and TACOM. Mr. Max Westmoreland, the Could Cost focal point at the Army Materiel Command (AMC), described in [10] the importance of executing appropriate contractual arrangements to implement Could Cost. In the case of FMC (and McDonnell Douglas) firm fixed production contracts were already in place. Westmoreland noted the need to avoid problems in current performance involving ongoing contracts. In these instances, the government and the contractors signed stand alone business arrangements that use the ongoing contracts as the baseline for negotiating changes. The arrangements identify the general terms and conditions and the methods for sharing the savings. The stand alone agreements also specify the scope of each Could Cost initiative, its projected savings, negotiating schedule, current and future contracts to be affected, and the planned effective date.

The draft FMC and Army agreement provided for a 50/50 sharing ratio. Savings would be measured for a one-year period on all contracts between FMC and TACOM. The effective date on overhead and general and administrative costs was one year after the initiative took effect. The one-year measurement period for direct cost savings began with the first delivery. As of May 1990, the agreement was still not signed by both parties because of specific exceptions taken by each party and excessive processing time.

The primary stumbling blocks to the agreement were the shared savings arrangement and the competitive posture of FMC for future competitions. FMC was concerned that it might be put at a competitive disadvantage if it initiated a specific Could Cost implementation that was unique to a particular program rather than accepted for DoD-wide application. For example, the company may have eliminated a specific manufacturing capability to comply with a military specification that was deemed unnecessary in the Could Cost process. However, some other future military program might restore that need and FMC would not immediately have the capability. FMC hypothesized a situation where another company that had not eliminated the capability would hold what they construed to be an unfair competitive advantage.

b. Results

As of August 1990, no Could Cost recommendations had been implemented because of the absence of a signed business agreement. This resulted from disagreements over various terms and the apparent lack of management emphasis emanating from the overall decline of Could Cost as a viable DoD program. The situation has been by recent turmoil over future buys, which has produced program reductions and current restructuring. All Could Cost initiatives are on temporary hold until the reductions have been completed. All recommendations will again be screened to determine their relevance to the new program.

As previously noted, the program was initially well received by TACOM and FMC. However, it eventually lost most of its steam for a variety of reasons. First, the evaluation cycle was much too long. FMC originally submitted 59 initiatives to reduce costs but later withdrew 10 of them [12]. All but one of the remaining 49 proposals involved the elimination of government requirements. The final idea was a joint FMC- Army recommendation to improve the engineering function. Thirty-three of the ideas were approved and two were under consideration while the remaining 14 were disapproved. The Army categorized the proposals as follows (numbers of ideas submitted and approved or under consideration are shown in parenthesis): engineering (21/16), process operations (10/5), procurement (11/8), program management (2/2), materials (2/1), and financial management (3/3).

We also categorized the proposals using the framework of the cost reduction process and related taxonomy described in Chapter IV:

• Requirements defintion process	21 (total)
– Reduce specifications and standards	9
– Use commercial applications	2
– Eliminate unnecessary testing	2
– Reduce inspections	1
– Eliminate unnecessary data	7
• Conversion/manufacturing process	1 (total)
– Increase automation	1
• Business process	11 (total)
– Multiyear contracting	1
– Accelerate negotiation process	4
– Use cost-reduction contract	1
– Promptly dispose of government assets	1
– Reduce external audit	1
– Enhance accountability of government assets	1
– Use contract incentives	1
– Reduce meetings	1
Total proposals	33

The estimated savings, which represent a rough approximation from the 35 recommendations (including the two under consideration), were about $53 million or 19% of the FY 1989 contract value of $281 million. About $38 million or 72% of the total savings was due to multiyear procurement. The remaining $15 million or 28% of the savings averaged about $441 thousand per recommendation. Both TACOM and FMC declined to provide us with any estimated savings on individual proposals until the negotiation process was complete.

Westmoreland noted that FMC did not submit any suggestions to improve its internal operations primarily because FMC implemented major cost reductions just prior to

the Could Cost application. This resulted in the negotiated FMC cost for each Bradley being reduced by 30%.

c. Observations

Based on the flexibility curve described in Chapter II, our starting point for projecting savings on a program already in production such as the Bradley FVS would be under 5% of the total life cycle without multiyear procurement (MYP). The results achieved (without MYP) in terms of contract percentage are in line with the life cycle projection. We also noted that about 50% of FMC production costs were related to competitively purchased material.

In May 1990, the Army was performing a Should Cost program that would estimate savings for both multiyear and improved efficiencies. Theoretically, a properly structured Could Cost program would obviate the need for a separate Should Cost study because the contractor would have been sufficiently motivated to eliminate internal inefficiencies. We recognize that an independent review by an outside group of functional experts would uncover previously overlooked items. However, an effective Could Cost program should have identified the major areas for improvement and the remaining potential savings would likely not be justified by a cost/benefit analysis. We should also point out that the savings achieved through Should Cost are cost avoidance based on contractor estimated costs contained in the proposal. It is very difficult, if not impossible, to determine the portion of these costs that represent a contractor's cost strategy for both Should Cost and contract negotiations. Therefore, we could not identify real cost savings resulting from increased efficiency rather than business strategy.

We noted that savings estimates changed as the Could Cost recommendations proceeded to implementation. Initial FMC estimates of savings tended to be higher when the recommendations were first discussed and rough approximations were made. The savings optimism declined considerably when specific cost proposals had to be put together. Apparently, the potential loss of resources to individual managers did not seem real or likely until the specific recommendation was being put on contract.

We also observed a reluctance on the part of government personnel to endorse recommendations that will result in a return of a portion of the savings to the contractors. This attitude can evolve because the government representatives feel that the contractor should have already recommended the change in the established contractual process (e.g., non-essential government requirements) or should take the action on its own (e.g., improvements in contractor internal efficiencies). We do not have sufficient information to

comment on the validity of this attitude other than from a business perspective. The current government focus should be on reducing current and future costs. If lower total costs can be achieved by allowing the contractors to retain a portion of the savings, the recommendation should be approved. The attitude described above, even if correct, deals with historical sunk costs that could only be changed retroactively through legal remedies.

The relevant issue is cost reduction now. It is clearly in the best interests of the government to voluntarily reduce costs. However, lower costs will generally not be in the contractor's best financial interests particularly in a sole-source environment. Cost reduction is not worthwhile unless the loss of a portion of the cost base is, at least, partially offset by a return on some of the savings. This allows the contractor to smooth out his resource planning and implementation process for people, equipment, and facilities. This situation is somewhat similar to DoD's efforts over the past several years in cutting its own internal resources, particularly in the personnel area where normal attrition is generally the preferred course of action.

The recommendations on the Bradley can be categorized into those concerning (1) reduction in specifications, (2) elimination of data reporting, and (3) acceleration of the contractual process. With the exception of multiyear procurement, no single item appeared to be significant. The majority of approved recommendations (64%) were categorized as product requirements. Nine of those proposals dealt with reduced and tailored specifications involving drawings, technical formats, and elimination of specific military specifications. Seven of the proposals eliminated reports or certain data items in a given report. Only one recommendation, a relatively minor one, was made to improve the manufacturing process. This was not unexpected due the maturity of the program, FMC's recent cost-cutting efforts, and the sole-source environment.

2. Apache Helicopter

The AH-64 Apache is a twin-engine, rotary-wing aircraft designed to provide direct aerial fire in support of ground units [13]. The Apache can effectively perform both at night and under adverse weather conditions. It can be used against a wide variety of targets, including armor. Current armament includes the Hellfire antitank missile system, 30mm automatic gun, and 2.75-inch rocket. The Apache also serves as the platform for the Target Acquisition Designation Sight/Pilot Night Vision Sensor (TADS/PNVS). This system acquires and designates targets in support of Hellfire and other guided munitions.

The helicopter is produced by the McDonnell Douglas Helicopter Corporation (MDHC) at its Mesa, Arizona, plant. The Martin Marietta Corporation, in Orlando, Florida, produces the TADS/PNVS system and General Electric (GE) in Lynn, Massachusetts, manufactures the engines. The Army Aviation Systems Command (AVSCOM) in St. Louis, Missouri, is the responsible government management organization with specific program management responsibility assigned to the Advanced Attack Helicopter Project Manager.

The Apache has been in sole-source production since April 1982. The current MDHC, Martin Marietta and GE contracts are firm fixed price. The contract for the eighth production lot was awarded in September 1989. A total of 539 aircraft were delivered as of December 1989. Total procurement quantity is 807 with the last buy of 132 in 1990. Total acquisition cost is approximately $11.8 billion.

a. Application of Could Cost

MDHC also volunteered to participate in the Could Cost demonstration. To initiate the effort, the Army and MDHC agreed on the following general approach (which was similar to that used on the Bradley FVS):

- MDHC with government assistance would develop potential candidates.
- The government and contractor team would scrub the list and approve candidates.
- MDHC would submit proposals for negotiations.
- The government and MDHC would incorporate proposals into applicable contracts.

The original MDHC focal point was the Apache program director who was very aggressive and supportive of the Could Cost process. The current focal point, who works in the logistics area within the project office, was assigned after the incumbent left his position as program director and after the DoD lost interest in the Could Cost program. The AVSCOM focal point came from within the cost analysis area and also served as acquisition team leader that evaluated MDHC contract proposals on the Apache.

As was the case with FMC, MDHC and the Army attempted to execute a separate business agreement for Could Cost application. However, there was one major difference in that no standard sharing arrangement was made between the contractor and the government because of the diversity in the types of benefits, savings, costs to implement, and risks. In December 1988, the Army and MDHC signed a memorandum of

understanding (MOU) regarding the overall Could Cost approach. A copy of the memorandum can be found in Appendix A. The memorandum of agreement specifying the details was never negotiated. Recommendations that were implemented were incorporated in the established contractual process.

Also, because of a shortage of personnel and the need for timely turnaround on the proposals, the Apache project office contracted a consulting firm to evaluate and report on the MDHC Could Cost ideas. The project office was then to use the consultant's report [14] as the baseline for approving proposals and subsequent negotiations with MDHC.

b. Results

In July 1988, MDHC initially submitted 147 ideas [12] to AVSCOM for Could Cost but did not estimate the potential savings. The Apache acquisition team in coordination with other AVSCOM functional elements selected 58 of the ideas for possible application and requested proposals from MDHC. The team segregated the proposals into two phases. Phase I candidates did not require extensive preparation time and could be proposed within a short period. Phase II candidates were much more complex and required significantly more time and effort to develop and submit the detailed proposals. In February 1989, MDHC submitted 8 candidates and followed-up with an additional 9 in April 1989. Subsequently, two recommendations were deleted and three were added. They also recommended that the remaining items be eliminated from consideration because they could not identify any savings.

MDHC had estimated savings of about $6.7 million without multiyear procurement or about 1% of the estimated production contract cost. This was a sharp drop from the original MDHC estimates of about 5% to 10% of production costs. The demonstration apparently never reached its potential because of instability in the production quantities that repeatedly surfaced during the previous 18 months. The result was a cut in the total procurement buy of 975 shown in the December 1988 SAR to 807 in the December 1989 SAR. In addition, the last buy now occurs in FY 90 rather than the previously planned FY 94 date. This reduction also obviated the need for multiyear procurement, which had been estimated to produce about 12% in production contract savings. The breakdown of the final 18 proposals is shown in Table 3.

c. Observations

As a production program, the cost flexibility curve projects an average 5% savings in life-cycle cost. However, when Could Cost was introduced, the Army and MDHC were already negotiating the buy for the eighth lot, which would have further decreased the opportunity for saving. In terms of contract percentage, the MDHC effort was therefore understandable given the cutback in production and ensuing loss of program momentum. However, we should note that MDHC was generating cost improvements through the Value Engineering program. Estimated production savings were about $13 million, which would have more than doubled the Could Cost benefits, pushing up total savings to about 3%.

Table 3. Proposals for Reducing Cost of Apache

Process	Number of Recommendations	Thousands of Then-Year Dollars
Requirements definition		
Reduce specifications and standards	1	34
Eliminate unnecessary testing	4	1,953
Eliminate unnecessary data requirements	4	456
Total requirements	9	2,443
Conversion/manufacturing		
Control and limit ECPs	1	1,126
Business		
Economic order quantities	2	1,227
Streamline contractual process ECPs	2	789
Reduce internal documentation	1	267
Streamline organization, reduce meetings and travel	3	1,553
Total business process	8	3,125
Total proposals	18	6,694

The government also had performed a Should Cost on the FY 89 buy that resulted in a reduction of about $100 million or about 16% of the MDHC proposed costs. These results lowered the potential savings that might have been achieved under Could Cost. As in the case of the Bradley FVS, we noted (1) we could not determine how much of the Should Cost savings could be attributed to a negotiation strategy, (2) properly structured and implemented, Could Cost may have rendered the Should Cost effort unnecessary or, at least, significantly reduced in scope, and (3) estimates of Could Cost savings declined as the recommendation came closer to being incorporated into the contract.

3. Advanced Antitank Weapon System-Medium (AAWS-M)

We were particularly interested in the AAWS-M experience with Could Cost because it appeared to have the most relevance to the expected Strategic Defense System application. First, it was the earliest application of Could Cost. It was introduced in the summer of 1988 during the later stage of the Demonstration/Validation phase and incorporated as a requirement in the RFP for Full-Scale Development (FSD). Secondly, it was a competitive environment with three contractor teams competing for the FSD and low-rate initial production (LRIP) contract. Full-scale production would be competed between the two contractors on the winning team. Third, specific Could Cost language was included in the contractual process. It was an element in the RFP, as noted above, a separate clause in the FSD contract, and incorporated specific financial incentives.

The AAWS-M consists of a reusable command and launch unit (CLU) and a missile that is sealed in a disposable launcher container [13]. It is a portable antitank weapon system, operated by one soldier, with a warhead that can be used against both conventional and reactive armor. The CLU provides an integrated day/night sight and target engagement capability in adverse weather. The system is intended for both Army (the lead Service) and Marine Corps usage.

The prime contractors for AAWS-M are the Texas Instrument (TI) and Martin Marietta team located in Huntsville, Alabama. However, much of the technical work is being performed by both contractors at the TI facility in Denton, Texas. The team was awarded the $170 million FSD contract in June 1989 after a competitive design validation phase. The demonstrated technology was Imaging Infrared Fire-and-Forget technology. The validation phase lasted 27 months and involved two other competing contracting teams: Ford Aerospace-General Dynamics and Hughes Aircraft-Honeywell. The responsible government management organization is the Army's AAWS-M Project Office, an element of the Army Missile Command (MICOM), located at Redstone Arsenal, Alabama.

The current FSD contract is cost plus incentive fee (CPIF), but because the TI-Martin Marietta team bid no fee, there will be no contractor profit during this phase unless there is an underrun, which is unlikely. Both the contractor and the Army already project an FSD overrun of $5 million, as reported in the 31 December 1989 SAR [15]. The LRIP option will be fixed price incentive fee (FPIF). The Engineering Services portion of LRIP will be exercised at cost plus award fee (CPAF). Technical Manuals, New Equipment Training, and the Interim Contractor Support options will be exercised on a firm fixed price

basis. An additional award fee will be given for performance against goals for design to cost and design to operations and support cost.

The current plan is for a procurement quantity of 70,550 that consists of 58,000 for the Army and 12,500 for the Marine Corps. The then-year dollar cost of the two LRIP options scheduled for award in June 1992 and June 1993 are $165 million for 1,214 systems and $376 million for 6,144 systems. Total acquisition cost is estimated at $4.2 billion in then-year dollars.

a. Application of Could Cost

As previously noted, Could Cost was included in the RFP for FSD of the AAWS-M. The focal point within the Army project office was the Deputy Program Manager. Contractors were briefed on the purpose of the program and on implementation procedures before receiving the draft RFP. The final RFP included the following provisions for FSD and LRIP (see Appendix B):

- FSD: Savings were shared in the CPIF portion of the contract at 25% for the contractor and 75% for the government. For each approved recommendation, the contractor's target fee would be adjusted for its share of the savings after adjusting the contract target cost, target fee, and total cost for the total savings.
- LRIP: Savings were to be shared in the FPIF portion of the contract at 40% for the contractor and 60% to be for the government. For each approved recommendation, the contractor's share would be distributed by reducing the firm fixed price by 60% of the savings. This encouraged the contractors to propose changes to government requirements.

The incentive structure for the AAWS-M FSD and LRIP phases is shown in Table 4.

Table 4. AAWS-M Incentive Structure

	Savings to Contractor		
	FSD	LRIP	Comments
Contract clause	CPIF	FPIF	Same contract
Could Cost	25%	40%	Adds to fee and adjusts target cost
Value Engineering	50%	50%	Savings direct to contractor—no fee impact
Underrun	50%	70%	
Overrun	40%[a]	60[b]	

[a] Applied against fee until exhausted, then paid 100% by the government. Contractor bid FSD with no fee.

[b] Applied until price ceiling is reached, then absorbed 100% by the contractor.

Could Cost proposals were included in the Cost/Price area for consideration by the Source Selection Evaluation Board (SSEB). The priority of elements within this area were: LRIP Option I Cost/Price; FSD Cost/Price; LRIP II Cost/Price; Could Cost Proposal Savings; and Design to Cost (DTC) goals. The sum of the LRIP options are about double the importance of FSD and these three elements are significantly more important than Could Cost and DTC. Finally, Could Cost is much more important than DTC. Proposals were submitted with not less than (NLT) prices to avoid much of the detailed cost documentation typically required. Accepted proposals are included in the contract as separately exercisable and independent options and require detailed supporting cost information for government review and negotiation. Contractors may submit Could Cost proposals at any time.

One major drawback in providing summary-level recommendations during a competition was that communication between the government and contractor was limited in order to maintain a fair and open competition. As a result, government reviewers did not always have sufficient details of the initial proposal to make an informed decision.

b. Results

The three competing contractor teams initially submitted a total of 65 Could Cost proposals for evaluation by the SSEB and ultimate approval action by the Program executive officer [12]. Following selection of the winning contractor team and its related technology, the 16 Could Cost proposals submitted by the TI-Martin team remained in the model contract for consideration by the project office. The major proposal areas were (number of proposals shown in parentheses):

- Reduce specifications and standards (8)
- Reduce hardware requirements (1)
- Alternate program plan-schedule (2)
- Eliminate unnecessary data (5)

Eventually, they approved six proposals (specifications, 2; hardware, 1; data, 3) for full implementation at an estimated $.5 million in savings. Subsequently, a recommendation to reduce FSD hardware was approved, which resulted in additional savings of $.3 million.

c. Observations

The Could Cost savings were miniscule compared with the projected 15% in life-cycle cost savings for a program beginning FSD. We attributed the somewhat

disappointing results to several factors. First, the contractors reduced their costs because of the highly competitive environment for the FSD/LRIP award. As previously noted, the TI-Martin winning team even bid no fee. Also, no recommendations were made to improve the conversion process, which we largely attributed to the competitive process.

Secondly, the Army employed a team composed of functional experts from outside the program office to streamline RFP for FSD. This resulted in a reduction in RFP content from over 1,500 pages to just over 500 pages. The government program office felt this reduced many of the non-value added requirements and hence limited the opportunity for Could Cost savings. On the other hand, the TI-Martin team did not feel there were many substantive streamlining changes. Since we did not review the before and after RFPs, we were unable to estimate the effects of streamlining.

Finally, the Could Cost incentives may have been better structured in both the RFP and the contract. Could Cost was given relatively little weight in the source selection process. The focus of the three competing contractor teams was on winning the contract award; Could Cost was clearly secondary. In addition, the financial incentives were not favorable enough to encourage recommendations. Because there was a Value Engineering clause on the contract that offered a better opportunity for cost savings, it was best to categorize a recommendation as Value Engineering rather than Could Cost.

As of August 1990, two Value Engineering Change Proposals had been approved with savings of about $200 thousand. An Engineering Change Proposal with the potential of saving about $9 million had been submitted for approval about three months earlier but had not been fully evaluated.

C. THE NAVY EXPERIENCE: TRIDENT II MISSILE

The Trident II (D-5) missile is a strategic submarine-launched ballistic missile (SLBM) system intended to improve upon the performance of the Trident I (C-4) system by providing increased accuracy and payload capability at equivalent ranges [16]. The Trident II's larger payload requires fewer submarines to achieve the same level of deterrence. The prime contractor for the Trident is the Lockheed Missile and Space Company located in Sunnyvale, California. The responsible Navy organization is the Strategic Systems Program Office (SSPO) located in Arlington, Virginia. The major subcontractors are Westinghouse Electric, Sunnyvale, California, for the launchers; General Electric Ordnance Systems, Pittsfield, Massachusetts, for the fire control;

UNISYS Corporation, Great Neck, New York, for navigation; and Interstate Electronics Corporation, Anaheim, California, for test instruments.

The initial missile production contract was awarded in April 1987 to Lockheed, who has been operating in a sole-source environment since program inception. The three production contracts to date have been CPIF. The current procurement plan provides for 871 missile systems to be purchased through the year 2002. Total acquisition cost in then-year dollars is estimated at $37.3 billion.

1. Application of Could Cost

The Navy SSPO formed a team of approximately 100 people from within its own organization to conduct the Could Cost application. The effort lasted about six months and cost an estimated $6 million to $8 million. The principal players included the team itself, the Navy Plant Responsibility Office (NAVPRO), the prime contractor, and the major subcontractors. The ground rules for the effort were threefold:

- Challenge all requirements and methods of doing business.
- Do not compromise safety, performance, quality, reliability, and schedule.
- Understand risks.

The team was also directed to identify cost savings already affected within the program, as well as current and planned requirements and processes for potential cost savings. The baseline for measuring Trident II performance and Could Cost savings was the Trident I missile program which, like the Trident II, was developed and built by Lockheed.

Recommendations were developed by the prime contractor Could Cost team, prime contractor operating organizations, subcontractors, and suppliers. The four largest subcontractors actively participated as partners with the prime. One of the key features of the Navy approach was the detailed participation of the SSPO program manager (PM) in the evaluation process. Every identified recommendation for change was reviewed by the PM who had sole authority within the program office to disapprove an idea.

The SSPO team classified proposed changes into four major categories:

- Procurement practices represent the contracting methods and procedures, regulations, and other internal practices that may impede acquisition.
- Quality management is improvement in any part of the process that enhances hardware quality. The improvement can reduce costs by decreasing the need for monitoring activities such as testing and inspection.

- Streamlining requirements involve the reduction of pertinent program needs to the absolute minimum.
- Producibility engineering involves improving manufacturability, testability, and inspectability.

The SSPO also felt that the already established business structure was adequate to handle the Could Cost implementation. Accordingly, no separate or unique incentive structure was established for Could Cost. All recommendations approved for contract implementation were incorporated into the existing contractual process in the same way as any other proposed change.

2. Results

The team identified approximately $2.7 billion in savings, which consisted of $1.7 billion resulting from actions taken prior to Could Cost; $.5 billion in new savings and an additional $.5 billion in projected multiyear procurement savings that have not yet been approved. A summary of the savings by category and completion status is shown in Table 5.

Table 5. Trident II Missile Could Cost (CC) Savings

	Savings in Billions of FY 1989 Dollars			
Process	Prior to CC	Actual CC	Potential	Total
Requirements definition				
Quality management	.190	.335		.525
Conversion/manufacturing				
Producibility	.900	.050		950
Streamlining	.600	.075		675
Total	1.500	.125		1.625
Business				
Multi-year procurement			.5	.5
Total recommendations	1.690	.460	.5	2.650

Source: Reference [17].

The SSPO identified three major actions associated with the prior-year savings. First, in the quality management category, the $190 million estimated savings resulted from adoption of a new approach for missile acceptance. The planned government acceptance of

the missile body was changed to the Navy field facility rather than at the contractor's plant. This relocation eliminates such non-value added work as shipping, assembly and disassembly, testing, and technical and documentation support.

The second principal prior-year action was in the streamlining effort that synthesized two reentry vehicle designs into one. The new single design satisfied the separate DoD and Department of Energy test requirements, resulting in a lower demand for hardware that translated into savings estimated at $211 million. The third major action was in the producibility area, where support equipment savings of about $100 million were achieved through commercial applications, standardization, and adaptation of Trident I missile test equipment for use on the Trident II. Value Engineering proposals implemented during the development phase totaled 165.

The actions approved and implemented as the result of Could Cost and those that generated the most savings were in the quality management area. The enhancements consisted largely of reduced end-item testing for rocket motors, gas generators, ordnance, and electronics. A key element in the rocket motor approach was the expanded use of Statistical Process Control. The streamlining effort centered around reducing the number of audits and cost reports. In the cost area, savings were realized by increased use of existing contractor systems to satisfy the cost/schedule control system criteria. The producibility savings were directly attributable to the selection of low-risk design changes.

Future savings of about $500 million were tied to a proposed multiyear procurement (MYP). The MYP proposal projected savings from reduced contracting efforts (about $10 million), from achieving economic ordering quantities (about $90 million), and for incorporating an optimum production rate (just under $400 million).

3. Observations

The SSPO estimated that the total of actual and personnel savings represented about 20% of the costs, 16% without MYP. These results are consistent with the cost flexibility curve that would project a potential for roughly 15% savings. However, we were not able to specifically assess whether the estimated savings reasonably reflected the opportunity for savings. As previously noted, the standard for measuring savings was the Trident I, also built by Lockheed. Since Lockheed had been operating in a sole-source environment for so long, the predominant external measure of the efficiency of internal operations was left to the government negotiation process.

The Navy team approach was aggressive and personnel-intensive. We were impressed with the knowledge, understanding, and experience of the SSPO team leader, Captain John Mitchell, whose principal job at the time was the Director of the Technical Division. He emphasized the need to distinguish between types of weapon systems and to thoroughly consider and integrate its operational requirements into the cost evaluation process. These factors drive acceptable levels of program risk.

In the case of strategic missiles launched from a platform located at sea, performance risk should be very low since readiness and reliability are of paramount importance. This requirement necessitates a more conservative response to change and innovation to ensure that the needed performance is not compromised. Performance risk in the current environment is based on test results which, for missiles, is particularly expensive because the test articles are consumed. Therefore, program changes that necessitate any new or additional testing are usually more costly than programs such as aircraft that have reusable systems.

D. THE AIR FORCE EXPERIENCE: B-2 BOMBER

The B-2 is a flying-wing aircraft powered by four turbofan engines that provide 19,000 pounds of thrust each. It has twin weapons bays with a total payload capacity of 50,000 pounds. The B-2 design incorporates special shaping and radar absorbing materials to reduce its radar cross-section. These composite materials must use new and higher risk manufacturing technologies [18].

The Air Force B-2 Systems Program Office (SPO) located at Wright-Patterson Air Force Base manages the program. The prime contractor is the Northrop Corporation's B-2 Division located in Pico Rivera, California. General Electric in Evandale, Ohio, is the engine manufacturer. The two major manufacturing subcontractors are Boeing in Seattle, Washington, and Vought in Dallas, Texas. Final assembly and systems integration of the aircraft is performed by Northrop at the government-owned facility in Palmdale, California. The first flight of the aircraft occurred in July 1989.

The original Air Force plan was to procure 6 development and 127 production aircraft. The B-2 has been in Full-Scale Development since 1981 and in a sole-source environment since the beginning of the program. The FSD contract is a CPIF contract. The production contracts are fixed price incentive fee (FPIF). As of June 1989, the total acquisition cost was estimated at $70.2 billion in then-year dollars after adjusting for $6.3 billion in cost savings that are described in the next subsection. Recently, the B-2 has been

undergoing a major restructuring to accommodate a total buy of 76 aircraft, which represents the revised DoD position, although the final quantity buy is still very much uncertain because of the extensive congressional debate on the issue.

A key facet of B-2 acquisition costs is the large subcontractor and supplier component, which comprises between 60% and 70% of total costs. It was essential that any efforts at cost reduction must specifically target these costs.

1. Application of Could Cost and the Cost-Reduction Initiatives Program

The Could Cost application primarily resulted from the work of a special Air Force team that convened in April 1988. The team consisted of over 40 functional and management experts who had considerable acquisition experience. The expertise largely centered on the manufacturing, engineering, program control, and contracting functional areas. Their effort lasted just under two months. Given the extensive and comprehensive cost-reduction approach used by the team, the Air Force elected to use the work of the team as its Could Cost application. However, we should also make clear that the Costello initiative had no discernible effect on the work or the results of the team.

The FY 1988 Defense Authorization Act required DoD to establish a cost, performance, and management initiatives program for the B-2 program. The act also required the B-2 SPO to report annually on the status of all its cost-reduction initiatives and to develop a computerized data base to share and exchange data with Northrop. Given the congressional mandate and the potential for cost growth, the SPO and Northrop established a cost-reduction initiatives (CRI) program.

The work of the Could Cost team served as one of the elements for institutionalizing the cost-reduction process within the B-2 program office and Northrop Corporation. The SPO and Northrop signed a business agreement using the basic Industrial Modernization Improvement Program (IMIP) as its foundation and extending the structure to every possible idea to save costs. A copy of the original agreement can be found at the beginning of Appendix C. At the end of 1990, the SPO and Northrop were close to finalizing a new draft agreement that was designed to streamline and to better structure the original version. A draft copy of this new document is also found in Appendix C.

With strong encouragement from the SPO, Northrop eventually made similar arrangements with its major subcontractors. The agreements described the processing of cost-savings initiatives and provided ranges of incentives that varied according to the type

of recommendation and the source of funding. For example, if the government paid for the investment, all savings accrued to them. If the contractor used its own corporate funds, all savings are generally returned to the contractor until his investment has been repaid. Then the contractor earns a return on investment that averages about 25%. The contractor can also receive up to 37.5% return on investments made exclusively with its funds. All the savings beyond the negotiated level go to the government.

Northrop used an MOU that was not contractually binding and interim and final business agreements that were legally enforceable. Examples of each of these documents are located in Appendix C. We should also point out that the SPO did not use a separate Value Engineering (VE) clause since the business arrangement was viewed as encompassing VE as a subset. The SPO viewed VE by itself as being too narrow and restrictive.

Today, the SPO employs a cost-reduction team with representatives from each major functional division. The team meets regularly on a biweekly basis and with Northrop once a month. Northrop also has established a separate cost-reduction group that oversees the internal corporate process and meets on a weekly basis. Another key feature of the SPO process is the streamlined approval structure to implement proposed changes. A mini-board consisting of the division chiefs from engineering, manufacturing, contracting, and program control and a representative of the SPO Director has the authority to approve cost-reduction proposals. As a result, recommendations to lower costs can be approved within one day if necessary.

2. Results

The team initially identified $6.3 billion (then-year dollars) in acquisition cost-reduction initiatives. This total consists of new savings identified by the team. No credit was taken for any recommendations and attendant savings that were approved prior to this study effort. Thus the MYP initiative only shows $358 million in savings because $1.2 billion had already been estimated for this initiative. The team, however, projected the total cost reduction at $1.6 billion resulting in the $.4 billion difference.

The $6.3 billion total represented about 8.3% of the $75.8 billion in acquisition cost reported at that time. Excluding the multiyear procurement initiative, savings were at about 7.8%. The following were the major categories of savings segregated by the three weapon-system-related processes:

	Estimated Savings (Millions of Dollars)
Requirements definition process	
Enhance schedule	1,096
Streamline and tailor contract	5
Reduce data requirements	41
Security	159
Total	1,301
Conversion/manufacturing process	
Design changes	912
Manufacturing producibility	522
IMIP projects	448
Total	1,882
Business process	
Multiyear procurement	358
Support Equipment-EOQ	71
Should Cost	
Overhead	1,340
Direct	
Sourcing of suppliers	170
Competition threshold	43
Component breakout	971
Pooled procurement	88
Raise cost and pricing threshold	24
Reduced audits and surveillance	45
Total	3,110
Total of all initiatives	6,293

The team's estimate of cost savings was obtained in July 1990 and was valid for the original initiatives; however, subsequent program changes in quantities and schedule have eliminated some of the savings and lowered others. In July, the savings were being estimated for a buy of 75 aircraft, which was expected to be reduced by about one-half. The team's recommendations were implemented through the established contracting structure; no special procedures or clauses were developed for Could Cost. In terms of government financial motivation, an informal agreement within the Air Force allowed the program office to retain cost savings within the program for unfunded requirements and other initiatives that required an up-front investment to reduce costs.

The Could Cost study effort represented a broad look at general categories of savings. The savings accounted for on the ongoing CRI program represented specific

initiatives that could be traced to instant and future contracts. As of November 1, 1989, the CRI program showed $3.6 billion in actual savings and an additional $2.5 billion in potential savings, including $2.2 billion for multiyear procurement.

3. Observations

The SPO and Northrop personnel we met were highly motivated and optimistic about the CRI process and the opportunity for savings. Clearly, the process had developed into an important part of their culture. The CRI process was also well structured and documented, which allowed it to successfully withstand the scrutiny of government auditors.

Initially, we were limited in our ability to review the B-2 cost-reduction process because of the limited access to the program. During the past year this became less of a problem as more information was made available to the public. We also noted that highly visible programs such as the B-2 receive priority in personnel selection and assignment. As a result, such programs tend to attract the most competent, experienced, and motivated individuals, which should improve results in terms of cost reduction.

The B-2 cost-reduction process was the only program-wide "umbrella" approach we observed that was being applied on a continuous basis. However, we could not determine with certainty whether the cost-reduction process would have been institutionalized and made a part of the SPO and corporate culture without the congressional mandate. We suspect that it would not have, at least not with the same emphasis and depth of coverage that currently exists. High-level management interest and involvement in cost reduction outside of the SPO process causes the SPO director to take action.

The recommendations highlighted by the SPO and Northrop included the need to obtain ongoing management support and develop a top-down strategy, which requires a change to the organizational culture. The cost-reduction program must also be integrated with other programs, should be implemented concurrently at prime contractor and subcontractor facilities, and requires acceleration of the evaluation and decision-making cycle. The SPO enjoyed a significant advantage in its ability to contract without having to obtain approval from outside the program office. This encouraged innovation in contracting approaches, streamlined and requires accelerated the approval process, and generally facilitated the cost-reduction process. Without this contracting authority, the CRI process would likely be much less successful.

E. FINDINGS

Our review of the model programs for Could Cost yielded the following findings:

- The potential savings resulting from a cost-reduction process is much greater in a sole-source environment than in a competitive environment. The conversion and business processes are largely improved and made more cost effective by the motivation to win the contract award, provided that costs are a major consideration in the source selection process. In a competitive environment, recommendations to reduce costs tend to focus on the product requirements process. The sole-source contract offers the opportunity for significant savings in all three processes, i.e., requirements definition, conversion/ manufacturing, and business. Skillful negotiation of contract terms by the government is essential to obtain a fair price, i.e., a price that the competitive market would yield for similar work. An effective negotiation team must be well prepared with a thorough fact-finding audit and supplemented, as appropriate, by a Should Cost analysis.

- Cost savings resulting from suggested improvements in technical requirements, the conversion process, and acquisition strategy have the largest impact on total costs and must be achieved primarily during the Concept Exploration, Demonstration/Validation, and early FSD phases. While the latter part of FSD and the Production phase can have dramatic effects in terms of cost growth, they do not offer a major opportunity to effect new savings. When a program reaches production, recommendations to reduce costs center primarily on data requirements. However, the realized savings are not typically large because the bulk of the costs is associated with establishing the process to produce the data and has already been incurred.

- Acquisition initiatives such as Could Cost, Value Engineering, and different contract incentives mean different things to different people. The myriad of initiatives and potential for varying subjective interpretations further complicate the process and can be a barrier to maximizing total program cost reduction.

- Current cost accounting systems are not very useful in segregating and categorizing value-added and non-value added costs. Such information could increase the opportunity for savings in FSD and, particularly, in Production. Overhead, already the largest cost element, continues to increase as a percentage of costs and offers the greatest potential for eliminating non-value added costs as a program matures.

- The cost reduction process is most effective when the bulk of the responsibility and authority for management and approval reside within the program office given appropriate motivation and oversight.

F. LESSONS LEARNED

We identified six major lessons learned from our review of the model programs. We believe these lessons accurately reflect the composite results from the model applications. The first lesson summarizes the overall approach to be taken for cost reduction. The remaining lessons describe the means for effectively implementing the approach. In the descriptions below, we try to acknowledge any significant differences of opinion arising from among the five programs. Generally, our points of contact within the model programs agreed with our summaries, although there was some disagreement on individual lessons or parts therein. For example, the Navy point of contact felt that the existing contract structure was sufficient and, when used appropriately, provided adequate incentives to the contractor. Hence, he did not see a need for specific Could Cost or cost-reduction language in the contract.

- *A cost-reduction strategy is needed that employs both general and specific methodologies.* The general methodology is intended to address all available cost-reduction techniques to improve the acquisition process, including reducing requirements, improving the contractors' internal processes and producing a more cost-effective business environment. This establishes the general framework that serves as the departure point for the detailed program and related contract analysis and application. Each major phase of the acquisition process is evaluated for cost reduction by potential application of each relevant technique. The specific methodology involves incorporating specific provisions in the contractual process that encourage cost reduction.

- *To be successful, any cost-reduction initiative requires the support and involvement of high-level management.* Effective cost reduction can occur only when all of the key individuals from both within the government and the contractor are involved. It would be futile to implement such a strategy without the support of top management. Too many changes, both perceived and real, are needed to proceed without a firm commitment from management. Personnel involved in weapon system acquisition typically have more work demands for their time than time available. Management, by establishing a high priority for cost improvement, can focus workers' efforts to produce the desired results. After program inception, management must follow up and stay actively involved to maintain the necessary emphasis. Ultimately, this attitude must be instilled throughout the organization and made a real and important part of the organizational culture.

- *Any cost-reduction strategy should be developed and applied as early as possible in the acquisition cycle.* Early application provides the greatest potential for decreased costs. Cost reduction is also an ongoing process where

the initial strategy should be followed up by periodic assessment and additional application of the available techniques. The specific timing for the individual techniques within the overall strategy will vary by type and program phase.

- *An ad hoc team of multifunctional experts should be used at selected times to develop specific recommendations for cost improvement.* The use of a functionally integrated team of acquisition experts is very valuable in generating cost-cutting ideas. The team is most effective when it receives the cooperation and active participation of those responsible for the program to encourage necessary implementation and follow-up. The extensive time and effort involved in using teams demands that they be used on a limited and selected basis such as in RFP streamlining, Should Cost, or in conjunction with major program milestones.

  There is some difference of opinion about whether the team should be formed from within or outside the program. The principal argument for using internal program office personnel is that such personnel have more knowledge of and experience with the program than outside personnel, who usually must devote considerable time to become familiar with the program. On the other hand, outside personnel would bring a more independent, objective, and broader perspective. Our preference is for a combined internal/external team that obtains the benefits of both approaches.

- *Incentives should be established for generating cost savings that benefit both the government and the contractors.* Actions that result in savings should evolve on a two-way street where both sides participate in a win-win situation. One-way streets put both parties on a collision course that will result in the failure of the cost-reduction process. Savings generated by contractors can be partially and directly returned to them (e.g., Value Engineering) or used as an evaluation criteria in a competitive environment. In either case, the government benefits. The responsible government program office should be allowed to retain its share of the savings within the program to the maximum extent possible to allow for financing the unfunded requirements.

- *The government cost-reduction evaluation process should be streamlined. Contractor recommendations to decrease costs should be evaluated and decided upon promptly.* In the Services' Value Engineering processes, several examples can be given of the evaluation and implementation processes dragging on for several months to well over a year. We also observed long contractual processing lags in the Could Cost demonstration programs. These delays send the wrong message to the initiating contractor (and to the government) and, if widespread, are almost certain to derail the program. How serious is the project office about cost reduction if the recommendations receive a low priority for action?

We noted one other factor that affects the other lessons learned and their capability to achieve cost savings. The opportunity for cost reduction should theoretically be higher in a sole-source environment. Competition among contractors should result in more efficient internal operations in order to bid a low enough price to favorably affect final selection. However, the cost of establishing and maintaining that competition must be reevaluated as a program matures, particularly into the Production phase, when the potential benefits decline dramatically.

IV. PROPOSED COST-REDUCTION STRATEGY

What are the critical factors involved in reducing costs? How can the factors best be transformed into a structured action-oriented program that government and contractor acquisition organizations and personnel will want to implement? When should the cost-cutting actions be taken to obtain the maximum return? We try to answer these questions by proposing an integrated method for enhancing weapon system affordability that we refer to as a cost-reduction strategy (CRS).

As previously mentioned, we endorsed the broad interpretation of Could Cost as an umbrella approach to cover all reasonable methods to reduce, control, and manage costs. A myriad of cost-reduction techniques are available to acquisition managers for application to specific programs. These techniques may have varying degrees of effectiveness depending on how and when they are applied, the particular incentives selected for implementation, their interrelationships, and their ability to be integrated into the total program.

Most of the guidance on policy and implementation deals with each technique as a separate process. Our objective in formulating a CRS for the Strategic Defense Initiative Organization (SDIO) was to provide for consideration of all the techniques and application at the most favorable time, to encourage effective participation by the government and contractor sectors alike, and ultimately to achieve the lowest cost and highest quality product.

In developing the CRS for SDIO, it became apparent that the basic framework and structure would be useful for other acquisition programs in their cost-reduction efforts. In this chapter, we describe the CRS building process and the resulting foundation for specific program application. We first examine the factors that are consistently associated with lower costs. We then specify a taxonomy of current acquisition initiatives to reduce costs, assess its structure and incentives, and identify potential areas for improvement. We propose the CRS as an overall approach to improve the cost-reduction process and describe how it fills the gaps in the present system. We describe, in detail, the three CRS phases that provide a map from the general structure to the specific program and contract application. The chapter concludes with a summary of the major benefits and weaknesses of CRS applications along with a brief assessment of the potential of the CRS—Is it worth

the time and effort? Chapter V describes how we used the foundation constructed in this chapter to tailor a CRS plan for use by SDIO on a particular program.

A. REDUCING PROGRAM COSTS

Substantive reductions in weapon system program costs cannot be achieved without addressing many complex issues that cut across organizations and functional disciplines. Effective cost cutting entails examining the specific needs and operations of the targeted program. This approach contrasts with arbitrary fixed percentage cuts, which may achieve short-term savings, but are not efficient, particularly in the long term. The purpose of this section is to describe an overall framework that can be used in developing and applying a cost-reduction strategy to a particular weapon system acquisition program.

Efforts to improve the cost position of any given acquisition program are largely dependent upon organizational culture, knowledge, and motivation (both organizational and individual) to achieve common goals. We have further subdivided these success factors as follows:

- Culture:
  - Across-the-board organizational commitment
  - Staying power: emphasis and follow-up for continuous process improvement
- Knowledge:
  - Individual program acquisition process
  - Cost-reduction process
- Motivation: The right incentives.

We focus on understanding the cost-reduction process, developing suitable implementation strategies and establishing appropriate incentives that encourage cost reduction on a recurring basis. Program-specific knowledge, commitment, and staying power are only briefly mentioned because they are largely self-evident concepts.

1. Cost Reduction: The Factors

The CRS is not a stand-alone function developed independently of the acquisition process. There is no "cure all" for achieving lower costs. Rather, CRS is a pervasive concept that must run through the entire organization and its operations and, most critically, be internalized by the personnel. Successful weapon system programs seem to display common factors that usually contribute to favorable cost patterns.

A number of major factors are typically related to lower costs. These factors establish the links among performance, technical, and business requirements and their related processes as they affect costs. *The factors should be considered in every significant program action that affects cost. This requires both an awareness and willingness to routinely apply the factors.* A prime objective in recommending the continuous use and application of the factors is to elevate the importance of costs in program decision making to a level commensurate with technical and schedule performance. The effects of cost must be a major consideration of all acquisition personnel whether it be manufacturing, engineering, contracting, or any of the functional disciplines.

Based on our review of the general literature and numerous discussions with government and industry leaders, we identified five principal factors, which when present, can cause costs to be lower than they otherwise would be: effectiveness, efficiency, stability, simplicity, and innovation. All the cost reduction factors are interdependent and interact with one another; and, to some extent, they compete with and balance each other to attain the common objective of keeping the first factor, effectiveness, in alignment. These relationships are graphically depicted in Figure 3 and discussed individually in the remainder of this section.

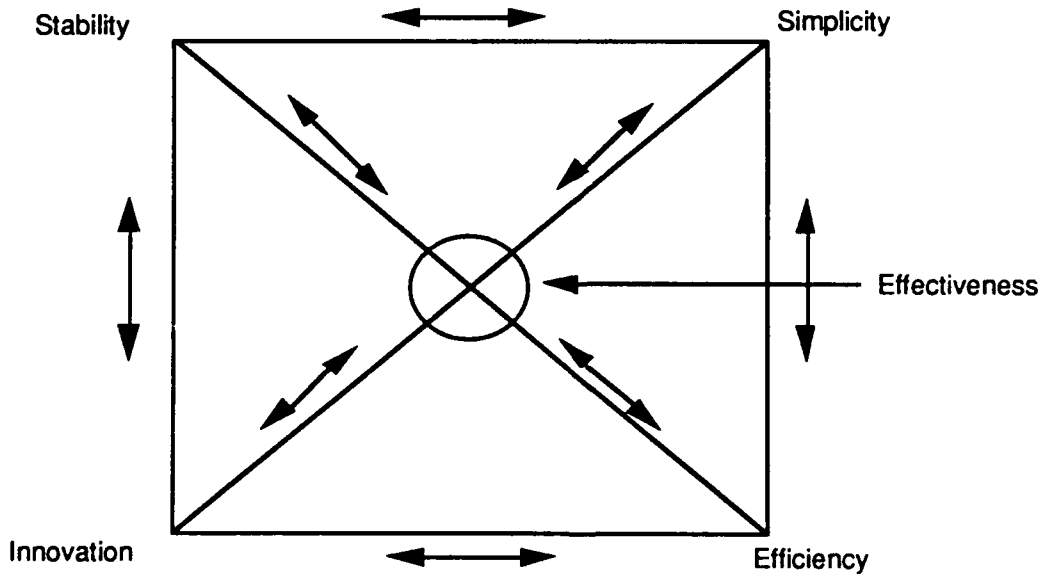


Figure 3. Cost-Reduction Factors

a. Effectiveness: Output Versus Expectations

Effectiveness refers to how well the final product of an organization satisfies customer requirements. It encompasses such other factors as availability, reliability, maintainability, and supportability. Effectiveness also includes the element of quality that represents the degree of excellence in the product in terms of the other effectiveness factors. Quality has a direct bearing on the other effectiveness factors, which, in turn, affect costs as described below. In addition, when one of the other four cost factors change, effectiveness has to be reassessed to ensure continued fulfillment of weapon system requirements.

b. Efficiency: Input Versus Output

The second factor, efficiency (also referred to as productivity), measures the use of all input and conversion resources required to produce a given output. For example, if output is held constant, efficiency increases as the quantity and cost of resources decline. First and foremost, efficiency requires the reduction and elimination of non-value added work. Efficiency can also address value added effort as new and better technologies (including automation), procedures, and practices, are applied to the conversion processes.

The role of quality is critical to efficiency. Quality can be viewed as the intersection of efficiency and effectiveness in anything an organization does. If the output requirements are maintained, increases in efficiency will translate into lower costs. If output does not meet established requirements, corrective actions will have to be taken that result in inefficiencies and higher costs. For example, production rework is a non-value added cost that was incurred because of a defect (ineffective because of poor quality) had to be corrected to create output that meets requirements.

The cost of poor quality is often underestimated when it is narrowly viewed to be a production problem only. The real costs associated with correcting quality deficiencies go well beyond the factory floor by generating more paperwork, more inspections, more management, and more engineering. Quality problems that are undetected in the plant and only discovered after the product reaches the customer are even more costly. These defects result in increased returns and distribution costs, including transportation, storage, and marketing, plus all the other costs that occur within the plant. Poor quality should also ultimately reduce sales as customers look to alternative sources of products. The option to look for alternative sources is somewhat limited for DoD because of the declining number of defense firms. Finally, and most importantly, poor quality realized while a weapon

system is in operation can hamper mission success, jeopardize safety, and even cause the loss of an entire system.

c. Stability: The Right Environment

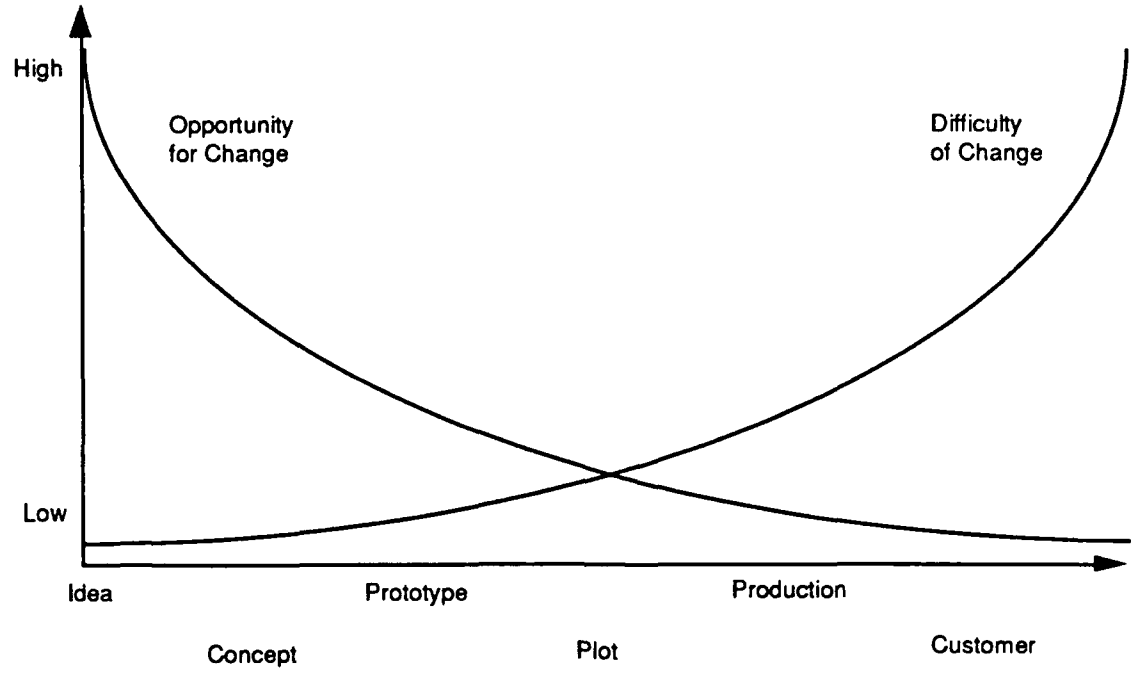
The third factor, stability, refers to continuity characterized by the absence of significant changes in technical, schedule, and cost requirements both individually and together as part of the total integrated program. The technical category includes the mission performance requirements as specified by the operating command; weapon system design and configuration to include specifications, standards, materials and components; manufacturing process design to include fabrication, factories, and equipment; and logistics support system requirements to ensure timely distribution and field operation.

Schedule stability means reasonably attainable milestones and deliverables that reflect the planned level of funding and technical achievement. Proper scheduling requires continuous and realistic evaluation each time a significant change occurs in either the technical or funding baseline. Accelerated and overly optimistic schedules will eventually increase costs. On the opposite end, stretch-out of the established program schedule will also result in cost growth.

Cost stability combines realistic estimating and budgeting that results in a funding profile that reflects the current technical and schedule baseline. Cost stability also involves a continuous process that demands particular attention in maintaining balance between the current cost estimate and the budget because these are generally separate functions performed by different individuals within DoD.

Instability, as seen in the number of changes in engineering proposals, funding, schedule, quantity, and technical requirements, has dramatic effects on costs. For example, a recent article on budget instability [19] emphasizes the dramatic cost effects of changing budgets. He asserts that during the past 20 years through 1988, the Navy budget would have bought 15% more in forces with the same amount of dollars if the funds had been made available on a planned and consistent basis.

Changes are best absorbed in the earlier stages of a program, which are structured for change and improvement to designs and processes. While the number of changes typically decrease over time, their impact on costs becomes increasingly higher with changes in production being very expensive. For example, Calkins et al. [20] point out the specific difficulty in making design changes as the program matures, as shown in Figure 4. This difficulty translates into higher costs.



Source: Reference [20].

Figure 4. Degree of Difficulty of Design Change Versus Time

d. Simplicity: Facilitates the Input-to-Output Conversion

Simplicity, the fourth factor, can be described as the absence of or freedom from complexity. Complexity adds processing costs to products by requiring more coordination and integration as well as additional time to learn, operate, and manage. The primary advantage of simplicity lies in the opportunity for markedly increased understanding of the underlying systems, methods, procedures, and operations that cause costs to be incurred. Enhanced knowledge and awareness expands the ability of the organization to identify and eventually eliminate non-value added work. Simplified processes can also mean faster employee learning, increased employee participation in generating recommendations to improve, and more flexibility and adaptability to change.

Simplicity cuts across the entire weapon system acquisition process. It starts with requirements that must be realistic, reasonably achievable and responsive to mission objectives. Such requirements are based only on the known and expected military threat and appropriately estimate only the needed capability to respond. Simplicity also means designs that meet engineering performance standards and can be readily adaptable to a simplified manufacturing process. Designs that are simple have fewer parts and are easier to manufacture and assemble. Simplicity in the manufacturing process results in a better

plant layout, easier identification and elimination of bottlenecks, and more efficient laborers who need less time to learn, react, and implement.

The advantages of simplicity in design and manufacturing carry over into the logistics support systems where maintenance, costs of spares and repair parts, and training should require less resources. In addition, even simplified information systems, at least in terms of customer products, can provide for better focus on those items that have the most effect on the acquisition process, i.e., input, conversion, and output.

e. Innovation: The Path to Continuous Improvement

The fifth and final factor, innovation, is the development and application of new ideas approaches, methods, procedures, and practices across the entire requirements definition, design manufacturing, and business processes. Any improvement that meets the final customer's needs in a more efficient and cost-effective manner will be identified, evaluated, and implemented, as appropriate. Continuous process improvement demands innovation or new and different ways of improving performance.

One of the primary elements in innovation is new technology that can improve the knowledge, methods, and equipment used in the input-to-output conversion. Technology includes information about the characteristics and quality of the end product as well as the conversion processes that produce it. Process technology applies to both the manufacturing process and the indirect support structure (overhead and G&A). Technological advances typically result in increases in technical performance, more efficient use of resources for a given technology and reduced conversion cycle. While technology can reduce costs if the technical, schedule, and budget elements are held constant, there is usually a tradeoff between improved performance (and sometimes schedule) and costs. This tradeoff ordinarily favors the performance side, which often causes costs to rise.

Increases in cost in exchange for needed technical capabilities may be reasonable and expected if utility exceeds cost. However, the main problem frequently found when this type of analysis is performed is the overstatement of marginal utility and the understatement of estimated costs. Finally, innovation also includes different management approaches, e.g., Total Quality Management (TQM) and concurrent engineering, used to direct and control resources so that program objectives are attained.

2. Factor Success: Making It All Work Together

Substantive program actions must not be made in a technical and schedule vacuum if the leadership and management are serious about cost consideration. It is our view that all significant decisions or activities affecting a program should include an analysis of the cost-reduction factors and their likely impact on program costs. Obviously, this does not preclude decisions that increase costs, particularly in those instances where mission success or safety are involved. However, it does mean that the responsible program personnel will more fully understand the cost implications of their decisions. Thus, our CRS proposes that the cost-reduction factor be analyzed in two dimensions:

- Selection and application of the cost-reduction techniques that are also referred to as the acquisition initiatives
- Ongoing program decisions that affect costs (e.g., engineering change proposals).

The success that factors have in achieving cost reductions are dependent on three conditions: (1) the particular technique selected and its related implementation cost, (2) the timing of the application of the individual factors and techniques during the acquisition life cycle, and (3) the extent to which the factor already has been integrated into the program. While the factors generally result in reduced costs, they still must be evaluated from a cost/benefit analysis standpoint to ensure that the means to achieve them are still cost-effective.

The marginal utility of a factor in terms of cost reduction declines with the degree to which it is applied in the program. The potential for the greatest savings exists when a factor is initially introduced. Gradually, the cost of attaining a factor increases and the benefit obtained decreases to the point where continued application actually results in "negative savings" or increased total costs. For example, the cost of using additional new technology as a program matures yields decreasing returns on performance, so the slight increase in benefit becomes less than implementation cost.

3. Current Approaches: The Acquisition Initiatives

DoD has developed and implemented a myriad of individual acquisition initiatives over the past several decades to improve cost performance. These individual techniques are applied to weapon system programs through the government process (largely requirements definition), the contractor process (largely conversion/manufacturing), and the contractual process (business) that establishes the formal relationship between the government and contractor. The objectives for applying the initiatives can be to achieve lower costs, higher

quality, or improved performance. Our focus, of course, is on lowering costs while maintaining or even improving performance and quality. This cost-reduction environment is shown in Figure 5.

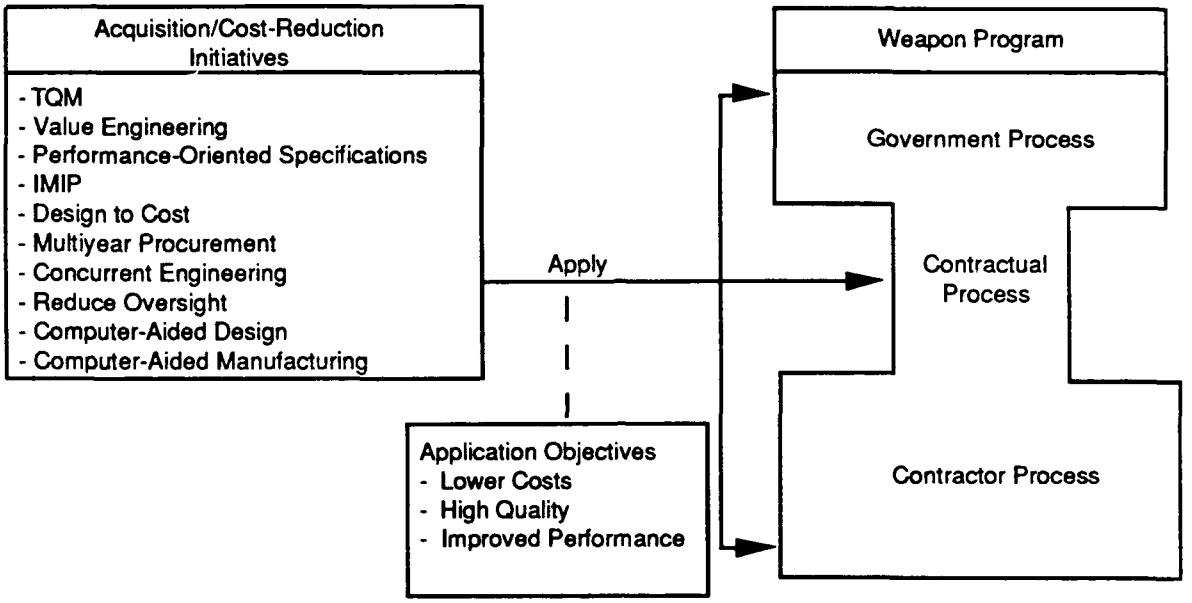


Figure 5. Cost-Reduction Environment

We developed a taxonomy of cost-reduction techniques as shown in Table 6 based upon a survey of available literature and our experience with the Could Cost model programs. The techniques are categorized first by the process model (see Figure 1) consisting of the product requirements definition (output) process, the manufacturing process (conversion), and the business process (input and business environment). The business process combines two elements because the input stage is essentially a business function consisting of procurement of materials and services from external sources, e.g., subcontractors and second-tier suppliers. The next subdivision within the process generally refers to the major functions being performed in that stage. A brief description of the techniques can be found in the glossary at the back of this paper.

The value of each technique stems from its capacity to extend the factors of effectiveness, efficiency, stability, innovation, and simplicity throughout the weapon system program and the related acquisition organizations. Much of that capacity revolves around the timing of the application of the technique, which is described in Section B of this chapter.

Table 6. Taxonomy of Cost-Reduction Techniques

REQUIREMENTS DEFINITION PROCESS	CONVERSION/MANUFACTURING PROCESS
Technical	Design
Use performance goals	Concurrent engineering
Reduce specifications and standards	Experimental design
Eliminate specification tiering	Consider reliability, maintainability, and producibility
Develop technical alternatives	Computer-aided design (CAD)
Use commercial alternatives	Control and limit Engineering Change Proposals (ECPs)
Eliminate unnecessary testing	Facilities
Use preplanned product improvement	Industrial Modernization Improvement Program (IMIP)
Incorporate prototyping	Government-owned, contractor-operated (GOCO)
Schedule	Production Technology
Develop realistic schedules	Manufacturing Technology Program (MANTECH)
Build in schedule flexibility; use desired/required delivery dates	Expand use of automation
Cost	*Computer-aided manufacturing* (CAM)
Design to cost	Computer-integrated manufacturing (CIM)
Design to life-cycle cost	Quality
Design to operating cost	Statistical Process Control
General	Eliminate waivers
Baseline requirements early	Control vendor quality
Reduce inspections	Management (goal is continuous process improvement)
Eliminate unnecessary data requirements	Total Quality Management (TQM)
Review and update security program	Reduce inventory and work in process
	Use just in time (JIT) approach

Table 6. Taxonomy of Cost-Reduction Techniques (Continued)

BUSINESS PROCESS
Acquisition strategy
Competition
Head-to-head
Teaming
Dual-source (leader/follower and licensing)
Apply competition strategies to subcontractors
Eliminate unprofitable competition
Multiyear procurement (MYP)
Economic production rates
Component breakout
Buyer pools
Warranties
Contracting
Incorporate cost-reduction provisions into contracts
Use value engineering
Limit size of RFP and proposal
Improve source selection process
Reduce length and use small expert panels
Use joint industry and government review boards
Reduce boiler plate provisions
Reduce cost and pricing data requirements
Perform Should Cost
Direct
Overhead and general and administrative
Government actions
Management
Decentralize management
Increase program manager's authority for approvals and reprogramming
Stabilize program office personnel assignments
Oversight
Minimize external audits
Reduce inspections and testing
Limit external visits to program office and contractors
Consider contractor certification
Information Systems
Enhance accounting systems
Segregate value and non-value added costs
Identify cost drivers
Maximize electronic transfer of data
Computer-Aided Acquisition and Logistics Support (CALS)
Reduce reporting requirements
Reduce internal documentation requirements
Cost-reduction implementation incentives
Government
Retain portion of savings in program
Reward managers for performance
Acknowledge risk and potential contractor profits
Contractor
Contract provides a portion of savings to be retained by the contractor
Other (award fee etc.)
Program Management
Streamline organization
Reduce number of meetings and travel
Emphasize subcontractor reviews
Simplify program, design, and milestone reviews

a. How Are the Techniques Tied Together?

We were unable to identify within DoD any common thread that held the acquisition techniques together in the form of an overall strategy, methodology, or system to address all the alternatives and to collectively produce the maximum possible cost savings. Apparently, these considerations are left to the discretion of the individual program offices and their interfaces within the government bureaucracy and, to a lesser extent, the affected defense contractors.

Within the DoD program office and related contractor environment, we have not observed any comprehensive or extended integration of the cost initiatives into a cohesive plan that can be effectively employed in the program management plan and the contractual process. Typically, the initiatives to lower costs are primarily subject to individual analysis and thus can be found piecemeal throughout the acquisition process.

The dispersion of cost-reduction information probably results from the functional orientation of the DoD process and its attendant organization. As previously discussed, there are numerous and varied techniques that may be applied to reduce costs. The responsibility for developing, implementing, overseeing, and evaluating the effectiveness of a given initiative normally resides with the functional unit. For example, the Industrial Modernization Improvement Program (IMIP) usually would be managed by the producibility or production office, and the test program, by the test and evaluation organization. Each of these programs has very significant cost implications that must be considered and included in a system cost-reduction approach.

It appears that the greatest potential for variation occurs in those activities that specify contractual, technical, and data requirements where responsibility is spread across many different functional entities. Consequently, the request for proposals (RFP) and the contracting processes represent a major opportunity and target for a structured and integrated approach.

b. The Incentives: What and Where?

The incentives available to the acquisition community to promote the successful use of acquisition techniques are predominantly financial and apply to the contract. Such contractual incentives include award fees, incentive fees, direct return to the contractor of a percentage of the savings from approved and adopted recommendations, profit, and, probably the most important, actually winning the contract. These incentives, if

successful, eventually affect overall company profits, stock value, financial health, corporate stature, etc., and establish a basis upon which employees may share in the reward process. A portion of the increased profits are available for distribution in various forms to the individual contractor employees who ordinarily have excellent opportunities to earn additional compensation through such mechanisms as bonuses, salary increases, and promotions.

The incentive structure for government personnel to reduce costs is not nearly as cogent or persuasive. In the absence of the profit motive, program offices can only reap some economic benefit if they are allowed to retain some or all of the generated savings for other uses within the weapon system program such as unfunded requirements. The lack of firm material motivation carries over to individual government personnel, where direct financial incentives are limited and typically found in the formal suggestion program. Indirect rewards in the form of career progression for both military and civilian personnel or annual cash performance awards for civilians are the only known financial opportunities available.

On the other hand, we noted that the existing structure often presents government personnel with strong disincentives to conducting business prudently and cost-effectively. Frequently, such personnel quickly learn that they are expected to create close to a risk-free environment with available funds for their program or area of responsibility. This zero-risk criterion can result in expensive and unnecessary overlay of program controls and contractor surveillance systems.

4. Areas for Improvement

Most of the initiatives listed in the taxonomy of cost-reduction techniques are well established processes within the acquisition community. We identified two major areas where new initiatives involving changes in current policies and practices could improve cost reduction results:

- Development and use of a systematic and integrated strategy and approaches to assess and apply all the cost initiatives
- Use of new and additional incentives to promote cost reduction.

The next two subsections describe the areas where we can offer specific recommendations, and propose other considerations for the incentive structure that require additional study.

a. General Strategy

We identified the need for a general application strategy from our reviews and observations related to program office operations. While our focus here is on the government side, we believe that a similar need exists on the contractor side as well. As previously noted, functional dispersion and fragmented responsibility for the acquisition initiatives make it difficult to optimize the potential for cost savings. There is generally no single individual or organizational unit that is responsible for all the techniques. One viewpoint is that this kind of cost visibility properly lies within the domain of the program manager or the principal deputy. However, it is unlikely that this individual will have the necessary time to identify, evaluate, and directly implement all the appropriate techniques at the right time.

As a result, the program manager should have a framework that allows for delegation but at the same time provides the means for effective management and oversight. The framework should also serve as the point of departure for the more detailed and program-specific analysis that must be accomplished in conjunction with the functional experts. This also requires the establishment of a designated focal point to lead, manage, and coordinate the program effort. It must provide for integration of all the initiatives that have to be considered individually and collectively to maximize total program cost savings. Finally, the individual tools within the framework must be applied systematically and on a recurring or continual basis in response to program dynamics.

b. Better Incentives

The development and implementation of an appropriate incentive structure for both the contractual and internal government processes is a very difficult and complex task. In both cases, incentives must be established for both the short and long terms and be consistent. Failure to consider either adequately usually results in a less effective solution and higher costs. We have confined our specific incentive suggestions in this subsection to the contractual process and will cover our other concerns in the next subsection.

The first critical step in formulating an incentive approach is to identify those actions you are trying to encourage. If a prime goal is the achievement of the lowest possible costs (while holding technical and schedule performance constant), the issue of costs must be placed on equal parity with the other objectives. It is not uncommon to hear a great deal of rhetoric about the importance of system costs and then discover that it has been relegated to a position of secondary, or tertiary, or lower importance in the contractual process.

Although the existing processes and structures generally furnish the needed mechanisms to satisfy most requirements, we found two situations where the adoption of new contractual approaches may produce additional cost savings. The first opportunity occurs during the RFP period when there is no specific financial incentive for the contractor to recommend changes to the acquisition process, whether it be in the requirements definition, contractor, or business process. Although contractors often have the chance to comment on draft RFPs, especially for new and technologically advanced systems, their efforts are primarily geared towards posturing themselves in the most favorable position for source selection rather than in gratuitously recommending across-the-board cost improvements.

The current focus of contractors in developing the response to the RFP is on meeting the established government requirements and not on any new and, perhaps, better way of doing things. However, this may be one of the more opportune times to re-examine the status quo and to explore the various possibilities for improvement for two important reasons. First, normally the contractor's best personnel are working the proposal. Second, the formulation of a best response to a proposal requires the contractor to "rethink" the entire process. This review period provides a natural and convenient follow-on opportunity to consider and introduce the potential for change.

The second area for possible enhancement is the actual contract. The present contracting structure does not adequately provide a direct financial incentive to induce the contractor to eliminate non-value added work and reduce costs. Current incentives such as those found in the Value Engineering program are useful in changing and improving contractual requirements. However, the incentive for the contractor to propose improvements in its own internal efficiencies may not always be adequate.

In the current DoD cost-based pricing environment and depending upon the particular circumstances (e.g., competitive environment, type contract, or projected business), it may be economically advantageous for the contractor to maintain some level of inefficiency within its own operations. Inefficiencies produce higher costs and create the opportunity for more fee and profit, including the establishment of a larger program business base to absorb more company-wide fixed overhead, including general and administrative costs. This would effectively lower the costs of the other programs within the same factory mix.

c. Other Incentive Concerns

The incentive structure is particularly challenging on the government side due to the need for public accountability, the political processes, and the DoD bureaucracy. This environment results in a plethora of laws, rules, regulations, and bureaucratic practices that contribute heavily to non-value added requirements and costs. How can the DoD acquisition community be motivated to actively, aggressively, and continuously participate in the cost-reduction process? We certainly do not pretend to have definitive answers if, indeed, they exist at all. We do, however, have some general thoughts, based on our observations and interviews, that may warrant further consideration. In effect, we recognize that these kinds of actions should be accomplished but are unable through this study to propose specific solutions.

First, program offices and their staffs need specific incentives. Programs that demonstrate an effective, ongoing, cost-reduction process resulting in the lowest attainable costs should be stabilized and given priority in both the budget and multiyear procurement authorization processes. For individuals, both civilian and military, cost reduction must be made a specific and significant element in the performance evaluation process.

Secondly, a procedure must be developed to indemnify contractors for their up-front investments (e.g., IMIP) to lower costs when subsequent changes in program direction negate their cost-effectiveness. This encourages a multiyear program (MYP) approach to contractor investments without the difficulties and limited chance for congressional approval that are associated with formal MYP candidates. Although this can be done on an individual program basis, as in the B-2, the lack of funding availability, particularly on smaller programs, might restrict coverage. We believe the opportunity for broader applications could be better realized on a consolidated basis. This could be in the form of an "insurance" fund to cover groups of programs in circumstances where the programs might be negatively affected if handled individually, but if handled together it would be highly unlikely that many of the programs would be adversely affected. Perhaps a source of funding, if approved by Congress, could be the available surplus budget authority generated through the lapsed (Successor M) accounts.

B. PROPOSED COST-REDUCTION STRATEGY

What is our cost-reduction strategy (CRS) and how should it be developed and applied? CRS is the systematic application of various techniques that are tailored to a specific acquisition program to lower costs without compromise to performance, quality, or schedule. This process must be viewed within the context of the organizational culture,

which will largely determine its success. The techniques should be applied by using appropriate incentives to collectively maximize the realization of the cost-reduction factors, which, in turn, produces lower costs. This cost-reduction process is depicted in Figure 6.

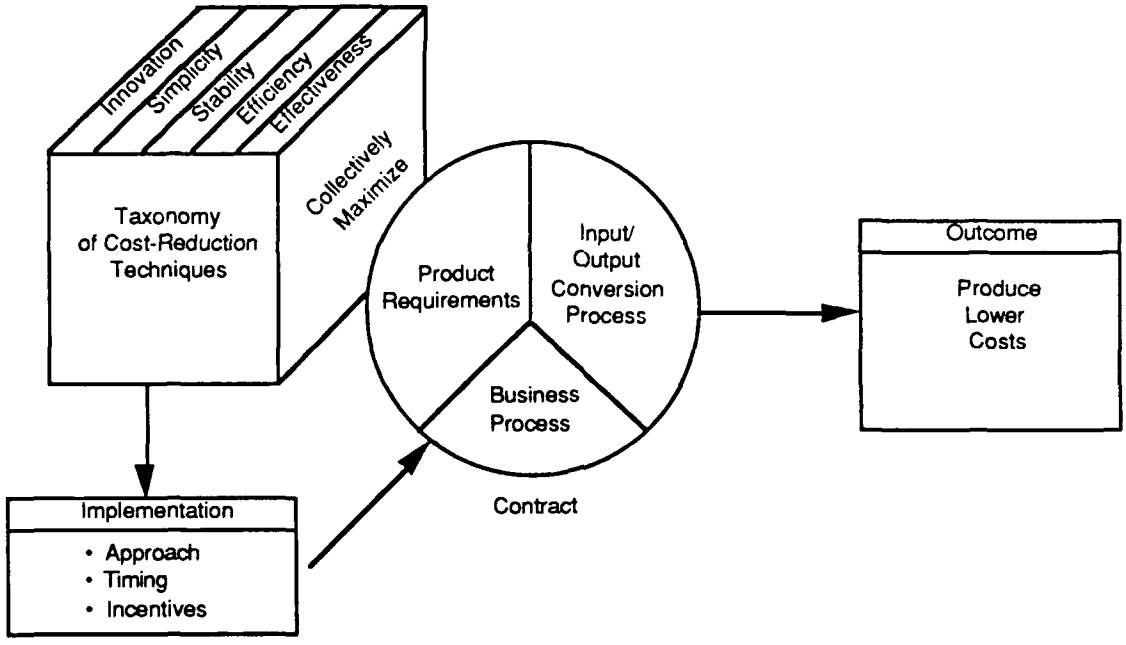


Figure 6. Proposed Cost-Reduction Process

Our view is that the probability for success and possible institutionalization of any new approach to reducing costs increases if the approach is evolutionary rather than revolutionary, i.e., the approach should fit reasonably well into the current acquisition operating environment. Therefore, a major objective in our proposing a new alternative is to complement and enhance the effectiveness of the existing initiatives. The relationship of the proposed CRS to the major DoD efforts, principally TQM and Value Engineering, is discussed in Section C. In this section, we describe the specific programs underway today and how they relate to our recommendations.

Our recommended CRS revolves around the development and implementation of a specific program plan that results from a series of three interrelated phases: (1) preparation, (2) planning, and (3) implementation. The preparation phase involves acquiring a basic understanding of the cost-reduction process for application on a continuous basis. This phase also involves extensive ongoing education and training of the program office staff and contractor personnel to attain management commitment and establish a cost-reduction consciousness within the corporate culture.

The planning phase involves analyzing and tailoring the general framework from the preparation phase to the specific needs of the weapon system. The product of this phase is the CRS plan for the entire acquisition program.

The implementation phase is even more narrow and short-run oriented. It is directed towards specific requirements and provisions of a particular program phase that is usually related to one or more specific contract.

1. Preparation Phase

The preparation phase consists largely of trying to incorporate and instill the concept of continuous cost reduction into the organizational culture. This necessitates familiarizing everyone involved with the cost-reduction process depicted in Figure 6.

The first target group is the top managers, including the program manager, functional chiefs, key staff, and, of course, the person assigned overall responsibility for the CRS. During this time, management commitment must be established and publicized throughout the organization. Each manager responsible for a specific technique will still focus on that initiative but will also have to coordinate and explain the appropriate interactions with the other affected initiatives. The goal is to realize the lowest possible costs given constant technical, schedule, and quality requirements.

In the next three subsections, we describe the framework for the preparation phase, which serves as the point of departure for detailed program analysis. We summarize the cost-reduction strategy in terms of what we are trying to do and why, when it should be done, and how it should be done.

a. What and Why?

In the previous section, we described the cost-reduction factors and the current acquisition initiatives that can help in achieving them. Our primary focus for this study is on those initiatives that directly affect contract costs since they ultimately constitute most of the acquisition costs. We now address the interrelationships among the factors for both cost reduction and cost increases, the predominant causes for existence of the factors, and how the initiatives may be useful as a remedy for correcting the negative factors. This approach is intended as a diagnostic tool that can be refined and expanded upon by program offices in their individual cost-reduction applications during the program planning phase.

The antithesis of the cost-reduction factors are the factors that contribute to higher costs: ineffectiveness, inefficiency, instability, complexity, and inadequate or excessive

use of technology. The presence of any one or combination of these factors will all but guarantee increased costs. By identifying the major causes of these conditions, we can also identify the appropriate acquisition initiatives that may be available to eliminate the negative factors and, in doing so, promote cost reduction. For example, inefficiencies in contractor operations may, in part, result from the inadequate competition, excessive competition, or ineffective negotiation. These unproductive activities can be overcome to some extent by introducing competition, by earlier downselect, and by the use of more effective preparation for negotiations, including expanded use of Should Cost analyses. In those cases where appropriate remedies may not have been established, we offer our own recommendations.

The contract cost-reduction factors and initiatives are shown in Table 7. For each of the cost-increase factors, we tried to identify the principal causes for that condition. We then used the cost-reduction taxonomy to extract contract-related initiatives that were developed to deal with the underlying reasons for higher costs. Please note that we categorized the initiatives by the predominate factor, recognizing that they also affect other factors. For example, TQM should help improve the output as represented in the effectiveness factor and, at the same time, should reduce costs through increases in efficiency.

b. When Should the Taxonomy Be Applied?

Based on our review of the impact of selected acquisition initiatives, we developed some guidelines on when best to implement a specific taxonomy initiative. Table 8 summarizes the results of our experiences, including numerous recent discussions with knowledgeable government and industry representatives. The table is intended to serve as the beginning point for the more detailed program analysis necessary to develop an implementation plan. The techniques are grouped by the three major acquisition processes of requirements definition, conversion/manufacturing, and business.

We divided the preferred timing into three major categories: (1) the earlier the better, (2) not later than, and (3) not before. Generally, if any of the initiatives are applied outside of the recommended timing category, net cost savings will be difficult to achieve. In the "earlier the better" group, net cost savings can occur almost at any point, but the opportunity for savings declines considerably as the program matures.

Table 7. Factors and Initiatives in Contract Cost Reduction

Cost-Reduction/ Cost-Increase Factors	Causes of Higher Costs	Cost-Reduction Initiative
Effectiveness/Ineffectiveness	Inadequate management philosophy	TQM
	Lack of functional integration	Cost-reduction strategy Concurrent engineering/design, manufacturing, and supportability
	Poor quality	Statistical Process Control Eliminate waivers Reduce inspections Vendor quality controls Warranties
	Lack of clearly defined cost goals	Design to cost Design to life-cycle cost Design to operating cost
	Buy before fly	Prototyping
Efficiency/Inefficiency	Lack of competition	Competition[a] Head-to-head Teaming Dual sourcing (leader/follower, and licensing) Subcontractors and suppliers Should Cost Analysis More effective negotiation Use of certified contractors
	Inadequate financial incentives	Contract clauses Value Engineering Cost reduction Other (award fee etc.) MYP
	Unnecessary specifications	Use performance goals Eliminate tiering Reduce specs and standards Substitute commercial products
	Redundant actions	Preplanned product improvement Eliminate unnecessary testing Reduce oversight Minimize external audits Limit external visits to contractors Reduce inspections and testing
	Non-value added "middle man"	Component breakout
	Failure to apply economies of scale	MYP Economic production rates Buyer pools

Table 7. Factors and Initiatives in Contract Cost Reduction (Continued)

Cost-Reduction/ Cost-Increase Factors	Causes of Higher Costs	Cost-Reduction Initiative
	Inadequate and unnecessary information	Reduce reporting requirements Reduce number of meetings and travel Reduce internal documentation Maximize electronic data transfer CALS Enhanced accounting systems Segregate value and non-vale added costs Identify cost drivers
	Ineffective negotiation	Negotiator certification program Should Cost analysis
Stability/Instability	Changes in requirements, specifications, funding, schedule, and personnel	Baselining Limit ECPs Experimental design
Simplicity/Complexity	Materiel or processes that do not add utility to the mission or the product	Streamlining Processes Reduce pricing and cost data requirements Limit size of RFP and proposals Organization
Innovation/Status Quo	Complacency (resistance to changes because of comfort with existing strur ures	TQM Cost reduction in contractual process
	No-risk philosophy resulting from concern over failure	*Improved proficiency appraisal system*
	Use of obsolete production technology and facilities	CAD CAM CIM IMIP GOCO MANTECH

[a] Competition decisions should be based on cost-benefit analysis to ensure net savings, particularly as a program matures into production.

Our experience with the "not later than" category indicates that there is likely to be zero or even negative net savings if applied later. For example, design to cost (DTC) implemented during FSD has not proved to be cost effective [21]. The "not before" category mainly relates to initiatives that focus on relatively stable design and production requirements such as Value Engineering, warranties, and Should Cost involving direct costs.

Table 8. Recommended Timing of Initiatives

Cost-Reduction Initiative	Implementation by Acquisition Phase		
	Earlier the Better	Not Later Than	Not Before
Requirements Definition			
Technical			
Use performance goals	X		
Reduce specifications and standards	X		
Eliminate specification tiering	X		
Develop technical alternatives	X		
Use commercial alternatives	X		
Eliminate unnecessary testing	X		
Use preplanned product improvement	X		
Incorporate prototyping	X		
Schedule			
Develop realistic schedules	X		
Build in schedule flexibility: use desired/required delivery dates	X		
Cost			
Design to cost		DEM/VAL	
Design to life-cycle cost		FSD	
Design to operating cost		FSD	
General			
Baseline requirements early	X		
Reduce inspections	X		
Eliminate unnecessary data requirements	X		
Review and update security program	X		
Conversion/Manufacturing			
Design			
Concurrent engineering	X		
Experimental design	X		
For reliability, maintainability, and producibility	X		
CAD	X		
Control and limit ECPs	X		
Facilities			
IMIP			DEM/VAL (start)
GOCO			FSD (start)
Production Technology			
MANTECH			DEM/VAL
Expand use of automation			
CAM			FSD
CIM			FSD
Quality			
Statistical Process Control	X		FSD
Eliminate waivers	X		
Control vendor quality	X		
Management			
TQM	X		
Reduce inventory and work-in-process	X		
Use JIT approach			

Table 8. Recommended Timing of Initiatives (Continued)

Cost-Reduction Initiative	Implementation by Acquisition Phase		
	Earlier the Better	Not Later Than	Not Before
Business			
Acquisition strategy			
Competition	X		
Head-to-head	X		
Teaming	X		
Dual-source (leader/follower and licensing)			Production
Apply competition strategies to subcontractors	X		
Eliminate unprofitable competition	X		
MYP			FSD
Economic production rates			FSD
Component breakout			FSD
Buyer pools	X		
Warranties	X		
Contracting			
Incorporate cost-reduction provisions	X		
Use Value Engineering			FSD
Limit size of RFP and proposal	X		
Reduce cost and pricing data requirements	X		
Emphasize subcontractor reviews	X		
Perform Should Cost			FSD
Direct			
Overhead	X		
Government oversight			
Minimize external audits	X		
Limit external visits to PO and contractors	X		
Consider contractor certification	X		
Information systems			
Enhanced accounting systems	X		
Segregate value and non-value added costs	X		
Identify cost drivers	X		
Maximize electronic transfer of data	X		
CALS	X		
Reduce reporting requirements	X		
Reduce internal documentation requirements	X		
Cost-reduction implementation incentives			
Government			
Retain portion of savings in program	X		
Acknowledge risk and potential contractor profits	X		
Contractor			
Contract provides a portion of savings be retained by the contractor	X		
Other (award fee etc.)	X		
Program management			
Streamline organization	X		
Reduce number of meetings and travel	X		

c. How Should the Taxonomy Be Implemented?

The cost-reduction tools can be implemented in the individual government and contractor internal processes and in the contractual process. The objective is to select the approach that optimizes the potential for success while minimizing the cost of implementation.

Please note that both the requirements definition and business processes are dominated by the customer (DoD), while the manufacturing process is largely controlled by the contractor. Although the three processes are interdependent, we tried to identify the predominant implementation approach. An example is in the requirements area, which essentially is a government-dominated activity, first internally and then through its incorporation into the contractual process. We viewed the contractual process, with its many and extensive interfaces during the RFP, proposal submission and evaluation, and the actual contract, as the key to implementation.

We developed several general rules of thumb that can be used as the beginning step for the detailed program-specific analysis. First, if the initiative is unique to the internal processes of either the government or contractor, it should not be included in either the RFP or contract even though it may eventually affect the contract. For example, baselining is an internal government agreement between the program manager and senior management that summarizes the major technical, schedule, and cost elements that relate to the specific acquisition program. Although it is internal to the government, baselining has a definite effect on proposed changes to the contract and their attendant costs.

Second, if the initiative identifies what the requirements, objectives, and goals are (e.g., performance goals, design to cost, schedule requirements), it should be included in both the RFP and the contract. The "what" question establishes the desired output. Third, if the initiative answers the question of how the requirements, objectives, and goals, are to be implemented by the contractor, they should be included in the RFP. However, they ordinarily should not be placed on contract (e.g., TQM, concurrent engineering, and Statistical Process Control) but should be incorporated into the contractor's internal process. This allows the contractor more freedom in performance, which encourages the use of innovation and efficiency to satisfy requirements.

Table 9 shows our recommended implementation process that, again, should be revised to best meet individual program requirements.

Table 9. Approach to Implementing Initiatives

Cost-Reduction Initiative	Government Process	RFP	Contract	Contractor Process
Requirements Definition				
Technical				
Use performance goals		X	X	
Reduce specifications and standards		X	X	
Eliminate specification tiering		X	X	
Develop technical alternatives				
Use commercial alternatives				
Eliminate unnecessary testing				
Incorporate prototyping				
Schedule				
Develop realistic schedules	X	X	X	X
Build in schedule flexibility	X		X	
Cost				
Design to cost		X	X	
Design to life cycle cost		X	X	
Design to operating cost				
General				
Baseline requirements early	X			
Reduce inspections	X	X	X	
Eliminate unnecessary data requirements	X	X	X	
Review and update security program	X	X	X	X
Conversion/Manufacturing				
Design	X			
Concurrent Engineering		X		X
Experimental design		X		X
For reliability, maintainability, and producibility		X	X	
CAD		X		X
Control and limit ECPs	X			X
Facilities				
IMIP		X	X	
GOCO		X	X	
Production Technology				
MANTECH		X	X	
Expand use of automation				
CAM		X		X
CIM		X		X
Quality				
Statistical Process Control		X		X
Eliminate waivers	X			X
Control vendor quality		X		X
Management				
TQM		X		X
Reduce inventory and work-in-process		X		X
Use JIT approach		X		X

Table 9. Approach to Implementing Initiatives (Continued)

Cost-Reduction Initiative	Government Process	RFP	Contract	Contractor Process
Business				
Acquisition strategy				
Competition		X		
Head-to-head	X			X
Teaming	X			
Dual-source (leader/follower and licensing)	X			
Apply competition strategies to subcontractors	X	X	X	
Eliminate unprofitable competition	X			
Multiyear procurement	X	X	X	
Economic production rates		X	X	
Component Breakout	X			
Buyer pools	X			X
Warranties			X	X
Contracting				
Incorporate cost-reduction provisions			X	X
Use value engineering			X	X
Limit size of RFP and proposal			X	X
Improve source selection process	X	X		
Reduce cost and pricing data requirements	X	X	X	
Emphasize subcontractor reviews	X			
Perform Should Cost	X			
Direct	X			
Overhead	X			
Government oversight				
Minimize external audits	X			
Limit external visits to program office and contractors	X			
Consider contractor certification	X			
Information systems				
Enhanced accounting systems		X		X
Segregate value and non-value added costs		X		X
Identify cost drivers		X		X
Maximize electronic transfer of data	X	X		X
CALS	X	X		X
Reduce reporting requirements	X	X	X	
Reduce internal documentation	X			
Cost-reduction implementation incentives				
Government				
Retain portion of savings in program	X			
Acknowledge risk and potential contractor profits	X			
Contractor				
Contract provides a portion of savings be retained by the contractor		X	X	
Other (award fee etc.)		X	X	
Program management				
Streamline organization	X	X		X
Reduce number of meetings and travel	X	X	X	X

2. Planning Phase

A specific CRS must be developed and tailored to the individual program, using the framework from the preparation phase as a beginning point. Specific tools may be added or deleted and average timing patterns may be adjusted. Plan development will be greatly affected by the success of the preparation phase in gaining management commitment and staff support throughout the organization to create the necessary cultural change. This resolve of purpose in reducing costs must also be clearly communicated to the participating contractors in words and, more importantly, in all program actions that have cost implications.

The ultimate success of CRS and the degree of difficulty experienced in implementation is largely related to the cultural bias. In fact, if a reasonable level of commitment and support is not achieved within the early stages of the planning phase, it would probably be more productive to terminate the process. Otherwise, excessive delays, unresolved recommendations increasingly being overcome by events, and personnel apathy and frustration will likely surface and result in a largely non-value added effort.

The planning phase has four primary steps:

- Prepare skeletal plans in the form of an initial draft program plan and individual prime contractor plans by the government program office
- Request contractors' proposed plan in the RFP
- Assess plan (for source selection, if appropriate)
- Revise and finalize CRS plan for implementation.

The main thrust of the first two steps is on identifying, integrating, and "incentivizing" the appropriate techniques into a single cohesive strategy for the program. The third step focuses on specific contract application. The first cut at the draft plan should be prepared by a team of key functional experts who assess both their individual initiatives as well as the associated effects on the other initiatives. The intent here is not necessarily to develop detailed recommendations for implementation but rather to provide a working framework for the contractors and a baseline to assist in the program office evaluation of the contractor plans. At this point, it is better to include the maximum number of initiatives for consideration even though you may not be planning to use them all.

Wherever possible, a rough estimate of the expected savings associated with each initiative should be identified, i.e., "business as usual" without the initiative versus

"business as it could be" with the initiative. The projected savings derived after the contractor develops its own estimates can serve as a very important indicator of how the government and contractors should priorities and focus their efforts. Savings should be estimated by program phase, which will be useful for both budgeting and contract negotiating.

This same team of functional experts should then prepare the instructions for inclusion in the RFP. The instructions should request the contractors to provide a structure similar to that previously described in this chapter. An important factor here is the weighting for the source selection criteria. This provides an excellent opportunity for program management to send a clear message to the contractor that costs are really going to be consistently and continuously included as an integral part of program assessment and management. Sufficient weight must be assigned so that the goal of low costs is comparable to performance, technical, and schedule requirements. At the same time, the team must prepare their input for the model contract that contains those initiatives that already have been identified for implementation in this phase. The contract can be amended at a later date to accommodate any new initiatives that may be proposed and accepted from the CRS plan. Finally, the actual evaluation should be accomplished by that same multidisciplined team.

Each of the planned initiatives should be analyzed to determine that an adequate incentive structure exists either as part of the source selection criteria or as a specific contract financial incentive. The emphasis here should be on the non-contract-related initiatives that will ordinarily be more difficult to incentivize. Finally, the RFP should require more detailed information for the next stage or contract. The planned use of techniques in future stages must also be covered, at least, in general terms.

3. Implementation Phase

Implementation may be effected in several different ways as was previously shown in Figure 6. The keys to success are twofold: (1) selecting the appropriate technique and (2) continuous oversight and follow-up to ensure the technique is being properly implemented. Again, continued management commitment and support is crucial particularly to the oversight function and its inclusion in the corporate culture. This is most critical to the initiatives generated within the internal government and contractor processes that do not benefit from the established structure and legal guarantees that specific contract initiatives have to ensure performance.

We developed an example of a proposed summary level plan (Table 10) that could be the starting point for tailoring a plan for a specific program.

Table 10. General Implementation Plan Example

1. Preparation Phase
   a. Obtain top management commitment and support
   b. Designate overall CRS focal point, preferably at the level of deputy program manager or senior division
   c. Provide initial briefing to key program office (PO) and contractor personnel. Solicit their comments and recommendations on:
      1) Factors and initiatives
      2) Taxonomy timing and implementation process
      3) Integration of all initiatives
      4) Incentives
   d. Establish ongoing CRS forum for information exchange both within the PO and between the PO and the prime contractors and subcontractors
2. Program Plan
   a. Program office develops initial plan following the taxonomy structure outlined in Chapter IV
      1) Use input from program functional personnel that includes addressing the relationships with other initiatives
      2) Develop an estimated cost flexibility curve to show projected cost commitment and projected savings
   b. Prepare RFP instructions for the submission of the appropriate acquisition phase proposal on the CRS
      1) Provide contractors with the taxonomy structure from Chapter IV, which can be adjusted by the PO.
      2) Develop an estimated cost flexibility curve to show projected cost commitment and projected savings
      3) Submit specific individual proposals for initial screening with not-less-than savings estimates
      4) Develop model contract language for the cost-reduction clause using the Total Quality Management incentive structure as the financial baseline. Require the primes to establish similar agreements with their major subcontractors and tier suppliers
   c. Assesss contractor CRS plans for source selection
   d. Screen specific proposals and advise contractors to submit detailed proposals on approved ideas.
3. Contract Implementation
   a. Revise and finalize CRS plan and meet with winning contractor to discuss specific implementation
   b. Prioritize initiatives for implementation according to potential net savings and risk
   c. Incorporate cost-reduction agreement and specific initiatives in the contract at the prime, major subcontract, and supplier levels
   d. Evaluate contractors' detailed specific proposals; negotiate and incorporate into contractor
4. Ongoing
   a. Maintain ongoing forum and education process established in phase 1 above
   b. Periodically review and update the CRS plan
   c. Continually encourage specific proposals for improvement.

4. Contract Cost Reduction

The contract provides the vehicle for establishing a structure for continuous cost improvement between the DoD program office and the contractor. Therefore, the contract must include specific provisions for developing and submitting recommendations to lower costs. The two major alternatives are to use either an "umbrella" approach such as that implemented by the B-2 program or to follow the narrower Army approach that basically viewed Could Cost as an extension of the Value Engineering (VE) program. The choice depends largely on the relative maturity of the individual program.

During the early stages of a program, we prefer to use the all-encompassing "umbrella" approach because it consolidates all possible cost-reduction techniques. The B-2 structure is a reasonable baseline to follow in tailoring a specific program approach. Examples of the B-2 contractual instruments used to implement their approach can be found in Appendix C for both prime and subcontract arrangements.

Those programs that have already established a cost-reduction structure that meets their needs (e.g., individual IMIP and Value Engineering clauses), may want to supplement the existing provisions with another specific clause. Such a cost-reduction clause would provide incentives for all other recommendations that generate savings. These typically would involve non-value added requirements and improved contractor efficiencies. The AAWS-M contractual documents located in Appendix B can serve as a point of departure for individual program application. The documents include both the proposal process as well as the individual contract provisions. However, as previously noted, the incentive structure within the contract needs to be made internally consistent. The easiest and probably the most effective way to accomplish this is simply to adopt the VE incentive structure.

Please note that, in the case of an ongoing contract, program personnel may also prefer to use a memorandum of understanding (MOU), as did the Apache helicopter (Appendix A) and the Bradley FVS, or business agreements that can be incorporated into the contract. These instruments can be effective and avoid some of the major difficulties experienced by these two programs if they provide reasonable and consistent incentives, such as in the VE programs, that can be negotiated in a timely manner.

C. CRS AND THE CURRENT ENVIRONMENT

DoD probably has never encountered a shortage of studies or "new" programs particularly in the area of acquisition management and cost. There are enough critics both within and outside the department to almost guarantee a continuous flow of recommendations to improve defense operations. The supporting paper and attendant rhetoric are easy to find, but the "needed" institutionalized actions and sought after results are considerably more elusive. The reasons for this are complex and varied and well beyond the scope of this paper.

Our goal in developing the CRS was to establish a framework that would facilitate and encourage implementation. We intended CRS to be an ongoing management process to reduce costs, not just another "new" initiative to add to the seemingly endless stream into the acquisition initiative inventory.

1. Total Quality Management (TQM)

TQM continues to gain increasing momentum as one of the principal underlying operational philosophies for every type of organization and sector within the economy. DoD, in particular, is currently embracing TQM principles as the foundation for process improvements. While the TQM label certainly is no guarantee of a successful and long-lived program, we believe the basic principles of TQM are so sound and useful for producing either goods or services that they will be around for a long time. These include:

- Continuous process improvement throughout the organization
- Focus on organizational purpose, goals, and objectives
- Full involvement and participation by all personnel
- Team approach
- Positive reward system
- Streamlined organization and management structures
- Customer orientation
- Emphasis on quality and doing it right the first time
- Recurring education and training.

2. Combining TQM and CRS

Are TQM and CRS compatible within the DoD acquisition community? Absolutely. The principles outlined above apply to both approaches but only at different levels. TQM is

much broader as it is directed at all the operations of the organization. CRS is more specific as it aims at particular programs and contracts. Neither TQM nor CRS (in its broad planning perspective) is tied to specific financial incentives to encourage implementation. They are both, however, intended for inclusion in the RFP and as factors in the source selection process.

The primary motivating factor for TQM is more efficient and effective programs, which enhance a contractor's competitive position and, in the long run, increases profits. The specific elements or techniques of CRS as they apply to contracts typically have specific financial incentives. Both TQM and CRS share the same goal for timing, i.e., develop and implement at the earliest possible time. As TQM is implemented and becomes a part of the organizational culture, the organization should be increasingly performing at a higher level of efficiency and effectiveness. These improvements will significantly reduce the potential for cost savings as shown in the cost flexibility curves in Chapter II (Figure 2).

3. Value Engineering

Value Engineering (VE) is a well-known and somewhat successful program that has been institutionalized in varying degrees within each of the Services to lower contract costs. It has an established and well-documented structure that includes effective contract incentive provisions. This extensive use and institutional acceptance makes VE a sound part of the foundation upon which to build.

VE, as one of the specific CRS techniques, complements TQM and helps implement CRS (and TQM). These relationships are depicted in Figure 7. VE is the most specific approach because it deals only with precise contractual requirements and is primarily directed at contract deliverables. Because it is so specific and detailed, program offices do not normally use VE on contract until the program reaches the FSD phase, when most of the detailed design requirements are known and documented. VE, in its broadest application, can be used to effect any technical, schedule, or cost requirement to improve cost effectiveness. However, we have noted where individuals on both the government and contractor sides tend to view VE more narrowly by relating more specifically to design and hardware requirements.

This somewhat limited perspective of VE can reduce the potential for recommendations concerning cost cutting. In these instances, we believe a specific cost-reduction clause is particularly useful in establishing a much wider framework for cost

reduction to include all processes both within and outside the contract. In this sense, the cost-reduction clause expands the VE deliverable perspective to one that encompasses both the end items as well as the processes that produce them. The clause can also be used at any time (preferably early) in the acquisition process.

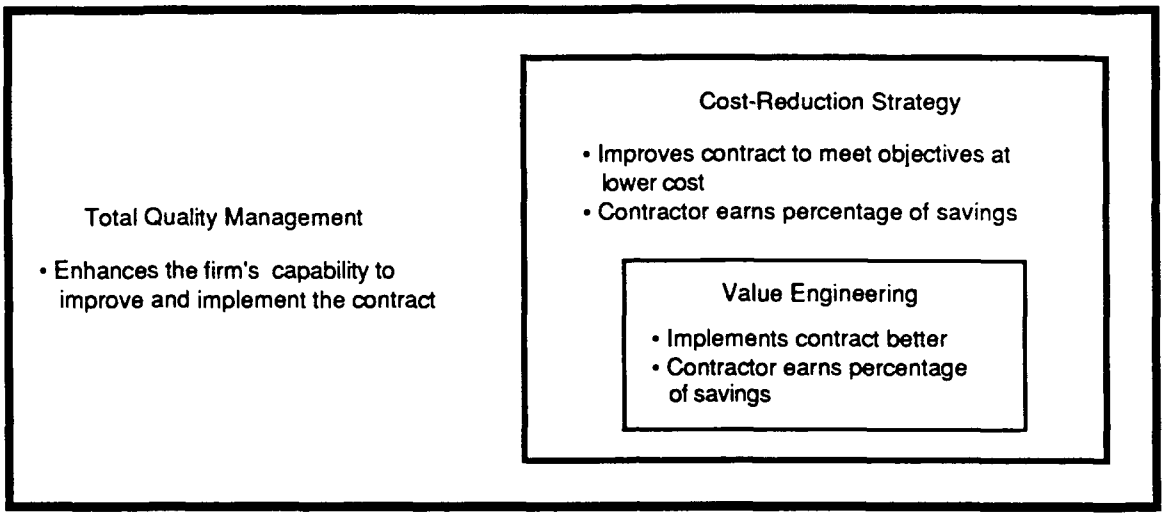


Figure 7. Contract Cost Management Environment

The real impetus for decreased costs must emanate from the government and contractor commitment to initiate and sustain a process that routinely makes costs a major and consistent program concern. We recognize that contractual clauses are not the panacea for cost improvement. However, we feel it is important to have the available tools that satisfy a reasonable and demonstrable need.

The above comparisons of TQM, CRS, and VE are summarized in Table 11.

D. CRS ASSESSMENT: ADVANTAGES AND DISADVANTAGES

Is CRS worth implementing? We attempted to answer this question by identifying and comparing the principal advantages and disadvantages of the proposed process. They are as follows:

- Advantages:
  - Can generate cost savings
  - Complements and helps implementation of TQM
  - Systematic and integrated approach will help achieve maximum consideration of all cost reduction methods
  - Is a commitment to cost savings

-- Helpful in instilling attitude

-- Helpful in achieving stability

- Disadvantages:
  - Resources (personnel, time, and money) needed to implement
  - Difficulty in overcoming bureaucratic resistance to change that may ultimately relate to job security and profit levels.

Table 11. Context for TQM, CRS, and VE

	TQM	CRS	VE
Broad view	Government/industry culture/process	"Umbrella" for acquisition initiatives	Specific CC in RFP
Narrow view	Manufacturing quality	Specific tool for program/contract cost-reduction clause	Specific recommendation
Focus	Organization wide	Individual program and contracts	Specific contract requirement
Contractual process	Source selection	Source selection and contract	Contract only and requires modification
Fee incentive	No	Yes, for individual initiatives	Yes
Timing			
Goal	ASAP	ASAP	ASAP
Observed	Draft RFP for FSD	Draft RFP for FSD	Usually FSD and Production

The degree to which these reasons should be considered vary by program and are largely dependent on the same factors that affect the opportunity for cost savings. These factors were outlined in Chapter II and include the type of program, relative maturity and stability of requirements, design and schedule, technological advances, individual contractor efficiencies, competitive environment, and quantities to be procured. For example, a very efficient and innovative contractor who has already adopted TQM in its corporate culture and who has just won a highly competitive contract probably will not have much opportunity for significant savings. Of course, this is a very unlikely scenario for most defense contractors because, if for no other reason, TQM is in the embryonic stages of development and application.

On balance, we think the CRS concept is worth applying to most acquisition programs. The general CRS effort must be tailored and reduced to meet specific program needs. Again, it is clearly more valuable (cost effective) to introduce CRS early in the process. A relatively mature production program, as we observed in the Apache and

Bradley FVS Could Cost demonstrations, is well down the cost commitment in the future and potential savings curves and offers little potential for major reductions. In these cases, a full and comprehensive CRS process is probably not appropriate. The use of the cost-reduction clause or business agreement along with training should be sufficient to generate suggestions for cost improvement.

V. CONCLUSIONS AND RECOMMENDATIONS

The changing world environment and the declining defense budget will almost certainly result in major alterations to the current weapon system acquisition process. The nature and extent of these changes are still largely unknown. However, we believe that most of the substantive information produced during this study will be applicable in the new environment.

The cost-reduction process is a dynamic and complex mixture of many different and, at times, competing variables. Our approach has been to identify and explain, wherever possible, many of the more significant relationships that reduce program costs. We eventually may also have the opportunity to demonstrate the viability of our concepts and structure on a specific Strategic Defense System (SDS) Program. Even without this visibility, we were able to develop specific recommendations and conclusions in several areas.

A. CONCLUSIONS

- The cost-reduction strategy (CRS) is a viable approach that fills an existing void in DoD's efforts to reduce costs because it is structured, can be applied systematically, and allows for consideration and integration of available techniques.
- CRS complements and helps implement TQM into the organizational culture since both are predicated on many of the same basic principles.
- The opportunity for cost savings declines dramatically during the Demonstration/Validation and Full-Scale Development phases. The major elements that drive cost are the technical requirements (including design), the conversion process, and the acquisition strategy. Also, the potential savings are ordinarily much greater in a sole-source environment than in a competitive environment.
- Major changes, including cost reduction cannot occur without commensurate changes in organizational culture. This demands management (and ultimately organizational) commitment, guidance, and support.
- The cost-reduction process must involve the best people using multifunctional teams at key stages of the process.

- Analysis of organizational and individual motivation and the related development and use of appropriate incentives is absolutely critical to the cost-reduction process.
- The cost-reduction process itself must exemplify the factors that it has been designed to achieve, i.e., to be highly effective, efficient, stable, simple, and innovative.
- The process is most effective when responsibility and authority for management and approval largely reside within the program office.
- Incorporating a cost-reduction clause or business agreement that encompasses all potential categories of improvement into the contract appears to be a useful and natural extension of the Value Engineering program.
- Contractor financial information systems do not provide sufficient data to distinguish between value and non-value added costs.
- The Could Cost program largely failed because of inadequate management involvement and support, absence of program definition and structure, and the inability of the concept originators to demonstrate that it was fulfilling a real and important need.

B. RECOMMENDATIONS

We distinguish between those recommendations that have a broad potential within DoD (intended for OSD and the Service consideration) and those specifically applicable to SDIO. The SDIO recommendations are very limited because of recent major developments that have delayed CRS consideration.

DoD-related recommendations include:

- Assess the CRS approach and consider further testing and development of the strategy.
- Consider a policy that requires the submission of a cost-reduction plan as part of the documentation requirements for major program milestone decisions.
- Continue efforts that expand the decision-making authority of the program manager.
- Strongly encourage acceleration of the evaluation and implementation phases of the Value Engineering program.
- Incorporate into the Federal Acquisition Regulation (FAR) a provision for a cost-reduction clause.

- Require notification by the program manager when implementation of contract cost-reduction initiatives is occurring after the recommended-not-later-than date.
- Encourage the enhancement of existing and development of new contractor accounting systems that provide more meaningful information, including identification of value and non-value added costs.
- Continue challenging individual functional requirements that mandate specific contract data or clauses with a multifunctional team of experts.
- Encourage defense contractors who have a sizeable commercial business base to use personnel from the commercial sector to participate in any major cost-reduction efforts.

Specific SDIO recommendations include:

- Select a specific SDS program to test and evaluate the proposed CRS.
- Plan and implement a training program for CRS and TQM.
- Assess the potential for applying CRS to the major Service-managed SDS programs.

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APPENDIX A.

APACHE HELICOPTER MEMORANDUM OF UNDERSTANDING

MEMORANDUM OF UNDERSTANDING

SUBJECT: Could Cost Initiatives

This Memorandum of Understanding (MOU) records a mutual understanding between representatives of the McDonnell Douglas Helicopter Company (MDHC) (hereinafter referred to as the Contractor) and the United States of America as represented by the Contracting Officer executing this document (hereinafter referred to as the Government), with regard to the subject of Could Cost Initiatives.

Definition:

The Government has initiated a pilot Could Cost Program which proposes that the Contractor and Government join together in a cooperative effort to reduce cost while maintaining quality standards and product performance. It poses the challenge - what could the cost and quality be if we changed the way we do business to focus on improving quality and producing more efficiently through such methods as operations streamlining, quality management, and internal company-wide should costing effort - with the Government and Contractor participating jointly to identify and eliminate unnecessary cost generating specifications and oversight requirements not mandated by law.

Understanding:

1. That each party will exert its best efforts, working together to accomplish the objectives of the Could Cost Program.

2. The Government and the Contractor will engage in discussions with a goal of reaching a Memorandum of Agreement (MOA) on Could Cost Initiatives acceptable to both parties. That MOA will serve as an advance agreement which will enable the parties to implement mutually acceptable initiatives against various contracts between MDHC and the Government.

3. The Government will evaluate all Contractor provided Could Cost candidates to determine suitability as viable nominees for further scope and content development, and for in-depth cost savings analysis. Upon receipt of the final set of initiatives with full description of scope and savings, as requested by the Contracting Officer, the Government will evaluate each initiative to establish a position of acceptability/non-acceptability, based on feasibility and potential savings.

SUBJECT: Could Cost Initiatives

4. The Contractor will, upon receipt of the set of nominees from the Government, proceed in a timely manner to develop a detailed description of each nominee, complete with method of implementation, description of estimated savings generated with any special formulation required, and any sharing arrangement expected.

5. It is understood that the MOA will provide a listing of each accepted Could Cost initiative along with a description of the basis by which each will be implemented, the savings generated through such implementation (to include any formula or factor, with base, needed to calculate the savings), any share ratio agreed to, and the effectivity for implementation.

6. Both parties reserve the right to unilaterally abrogate/ terminate this agreement with formal notification of the other party thirty (30) days in advance. The MOA will only list acceptable Could Cost initiatives. These initiatives may or may not be implemented on a contract-by-contract basis at the discretion of the cognizant Contracting Officer and by mutual consent of both parties.

7. Tentative Schedule of Accomplishment:

	Initial Group	Subsequent Group
Proposal Requested	13 Oct 1988	13 Oct 1988
Memorandum of Understanding	23 Dec 1988	23 Dec 1988
Proposal Submitted to Government	23 Dec 1988	31 Mar 1989
Completion of Government Evaluation	30 Jan 1989	28 Apr 1989
Commencement of Discussions	01 Feb 1989	01 May 1989
Conclusion of Discussion	15 Feb 1989	12 May 1989
Memorandum of Agreement	18 Feb 1989	17 May 1989

8. Nothing in this MOU shall be construed as a commitment on the part of the Contractor or the Government to implement any specific Could Cost initiative.

McDonnell Douglas Helicopter Company

C. F. Pickerel Jr. Manager
APACHE Production and Support Contracts
(Title)

Date 23 Dec 88

United States of America

Contracting Officer

Date 23 DEC 88

APPENDIX B.

AAWS-M CONTRACTUAL DOCUMENTS

DEPARTMENT OF THE ARMY
UNITED STATES ARMY MISSILE COMMAND
REDSTONE ARSENAL, ALABAMA 35898-5000

6 SEPTEMBER 1988

EXECUTIVE SUMMARY

AMSMI-PC-AD

SUBJECT: Request For Proposal (RFP) for Advanced Antitank Weapon System - Medium Full Scale Development (FSD) and Low Rate Initial Production (LRIP)

TO: PROSPECTIVE OFFERORS

1. Program Overview. The Advanced Antitiank Weapon System - Medium (AAWS-M) is a one man portable antitank weapon system designed to provide high lethality against advanced armor and is envisioned as a simple-to-operate, easily and economically maintained, rugged and reliable infantry weapon system for the U.S. Army and U.S. Marine Corps (USMC). The AAWS-M will replace the Dragon Weapon System in the U.S. Army. The Marine Corps' present plans are to field AAWS-M only in selected units. Three technology concepts for the AAWS-M are in the Proof Of Principle (POP) Phase of development. Competitive Full Scale Production will follow a successful outcome to FSD and LRIP Phases but is not addressed in this proposal. Development of training device prototypes and LRIP quantities of training devices are included in this program. FSD contract award planned for April 1989 is subject to program approval by the Department of the Army (DA) and the Office of the Secretary of Defense (OSD).

2. Acquisition Strategy. The Acquisition Strategy for the FSD and LRIP Phases requires a "team" approach. The "team" is a contracting entity composed of the POP contractor and a U.S. teammate who is capable of producing the system or performing as a system prime contractor in production. The "team" will complete the AAWS-M development and achieve the status of two qualified sources for system production by the end of the LRIP I Phase. During the LRIP I Phase, each team member shall produce a minimum of 10% (50% during LRIP II) of the production quantity of rounds, CLUs, and ancillary hardware such as consumables and containers.

3. Facilitization and Funding. The Government does not intend to provide facilitization for this program. The team shall provide all necessary facilities and include the cost in the unit price of the deliverable hardware. Production Special Tooling/Production Special Test Equipment (PST/PSTE) will be funded in accordance with a special provision contained in the RFP. Funds are not presently available for this acquisition. No contract will be made until appropriated funds are available from which payment for contract purposes can be made. The amount of $80 million of FY89 funds is anticipated to be available for the first increment of funding which covers the period of contract award through 31 October 1989.

4. Evaluation Criteria. Section M of the RFP outlines the basis for evaluation. Each proposal will initially be evaluated to assure that the Teaming and Target Engagement requirements have been met. Should it be determined that the proposal for Teaming and/or the Target Engagement results do not meet minimum requirements, the offeror will be deemed ineligible for award regardless of merit in other areas. The evaluation criteria for selection of contract award will be based on four (4) areas listed in descending order of importance:

(1) Operational Effectiveness/Technical

(2) Cost/Price

(3) Integrated Logistics Support/Reliability and Maintainability/ Quality Assurance

(4) Management/Production

Manpower and Personnel Integration (MANPRINT) factors have been dispersed throughout the four areas for evaluation purposes; however, a MANPRINT Program Plan with all selected MANPRINT activities will be submitted with the proposal as a separate volume.

5. Contract Type and Award Fees. The FSD contractual effort will be awarded on a Cost Plus Incentive Fee (CPIF) basis. Not To Exceed (NTE) unit prices must be provided in then year dollars. The NTE prices for Long Lead Time Items (LLTI) and LRIP Hardware Options will be definitized on a Fixed Price Incentive Fee (FPIF) basis prior to exercise of the option. The Engineering Services portion of LRIP shall be exercised on a Cost Plus Award Fee (CPAF) basis. Technical Manuals, New Equipment Training, and Interim Contractor Support Options will be exercised on a Firm Fixed Price (FFP) basis. The contractor is encouraged to develop innovative approaches to controlling the Army and Marine Corps' life cycle cost of ownership of the AAWS-M. An additional award fee will be given for performance in a Design To Cost (DTC) Program covering Design To Operations and Support Cost (DTOSC).

6. Could-cost. The AAWS-M Program is a designated Army Could-cost Program. As part of the Army's Could-cost initiative, requirements have been included which address implementing a Could-cost program. Examples of areas where Could-cost reductions might be achieved are included. An example is review of standards with special emphasis on tailoring of standards and specifications. The purpose of the program is to reduce contract cost and effort by reduction of non-value added requirements wherever practical. In furtherence of the initiative, Could-cost incentives have been structured in the solicitation.

7. Dual Sources. A minimum of two independent qualified sources for the system and for each item on the Critical Item List shall be established during LRIP I and maintained through LRIP II. Any subcontractor arrangements by the team with foreign companies shall be in accordance with authorized disclosure of classified military information. The capability of manufacturing critical components shall be established in the U.S.; however, this does not preclude the possibility of some off-shore production as second sources of these same types of components. Additionally these restrictions do not prohibit the possibility of co-production in the future.

8. Government Purpose License Rights. An option for a Government Purpose License Rights for AAWS-M System Level 3 Technical Data Package (TDP) is included. Prior to exercise of the first LRIP Option, the Army intends to evaluate its need for a TDP with Government Purpose License Rights. If such a TDP is unavailable by option exercise, separate negotiations or otherwise, the Army may elect not to exercise any or all options.

9. Delivery Schedules. All offerors are reminded that the delivery schedule is a material requirement of any resultant contract. The Army will vigorously pursue any and all existing remedies, including suspension of progress payments or termination for default, if the contractor becomes deliquent, or if it becomes evident that deliveries will not be timely due to contractor's failure to make progress.

10. Total Quality Management (TQM). Quality is critical to the Department of Defense (DoD). Contractors and their vendors must focus on quality as the vehicle for achieving higher levels of performance. Quality is synonymous with excellence. It cannot be achieved by slogans and exhortations alone, but by planning for the right things and setting in place a continuous quality improvement process. TQM is a concept that demands top management leadership and continuous involvement in the process activities. Emphasis must change from relying on inspection, to designing and building quality into the process and product. In this regard, maximum use of Producibility (Concurrent) Engineering and Statistical Process Control (SPC) is encouraged. Further, the contractor must be motivated for constant improvement in all aspects of the program.

11. Precedence. In the event there are any inconsistencies between this Executive Summary and the RFP, the provisions of the RFP shall govern.

Sincerely,

Paul Gattis

Paul Gattis
Contracting Officer.

CLIN	Supplies/Services	Qty	Unit	Not-To-Exceed Firm Fixed Price Unit Ceiling Price	Total Ceiling Price
0025	Performance of effort to accomplish Interim Contractor Support - Option II IAW Section C, SOW, Part 4 and ANNEX C, Part IV.	1	JOB	$_____	$_____
0026	DATA SUBMISSION - CLIN 0025. Interim Contractor Support Option II, IAW DD Forms 1423, Exhibit "A" Sequence Numbers: A043, A101, A128.	1	LOT	SNSP	SNSP
0027	Depot Maintenance Training Performance of effort IAW SOW Section C, Para 1AG.5.1, 1AG.5.2.1.3.10, 1AG.5.2.2.1-1AG.5.2.9	1	JOB	$_____	$_____
0028	Data Submission - CLIN 0027 Depot Maintenance Training IAW DD Forms 1423, Exhibit "A" Sequence Numbers: A158, A161-A167.	1	LOT	SNSP	SNSP
B-4. GOVERNMENT PURPOSE LICENSE					
0029	Government Purpose License Rights for AAWS-M System Level 3 Technical Data Package. IAW Section L-4	1	LOT	$_____	$_____

B-5. It is estimated that the total amount for reimbursement of costs for performance under CLIN 0001 is as set forth below:

Target Cost $_____
Target Fee $_____
Total CPIF $_____

Incentive Arrangement: Minimum Fee - 0 percent
Maximum Fee - 15 percent (excluding could-cost sharing)

Share Ratio: Underrun 50/50 - of the amount by which the total allowable cost is less than the target cost.
Overrun 60/40 - of the amount by which the total allowable cost exceeds the target cost.

B-6. It is estimated that the total amount for reimbursement of costs for performance under CLIN 0002 is as set forth below:

Target Cost $_____
Target Fee $_____
Total CPIF $_____

Incentive Arrangement: Minimum Fee - 0 percent
Maximum Fee - 15 percent (excluding could-cost sharing)

Share Ratio: Underrun 50/50 - of the amount by which the total allowable cost is less than the target cost.
Overrun 60/40 - of the amount by which the total allowable cost exceeds the target cost.

B-7. The performance of the effort required by CLINs 0013, 0014, 0022, and 0023, shall be on a Cost-Plus-Award-Fee basis, pursuant to General Provisions Clause 52.216-7.

a. It is estimated that the total cost of the work required by these CLINs is as set forth below:

Estimated Cost $_____
Base Fee $_____
Total Estimated Cost and Base Fee $_____

b. For performance of this effort the Government shall also pay the contractor a possible award fee of $_____ to be paid in accordance with Section H, Paragraph H-10, entitled "Award Fee Provision."

c. The base fee shall be 3 percent of the estimated cost, less cost of money or 1 percent of the estimated cost, whichever is less.

d. The possible award fee shall be 10 percent (base fee plus potential award fee) of the estimated cost (excluding cost of money).

H-8 TEAMMATE RELATIONSHIP.

a. It is the intention of the Government to accomplish the development of AAWS-M through the use of the contractual technique of a team contract. Unless stated otherwise, the term "contractor" shall refer to the entity representing the team. "Proof of Principle" contractor shall refer to the teammate who participated in the POP Phase and whose technology was selected for FSD. The contractor teammates shall establish a written agreement which addresses the teammate relationship. The primary objective of the teammate relationship/agreement is to insure that the Government obtains two qualified sources for system production.

b. The responsibility for interrelated management and technical activities between teammates to achieve the requirement of the contract shall remain the responsibility of the teammates. Disagreement between the teammates shall be resolved independent of Government intervention.

c. The complete discharge of the contractor's contractual obligations require the performance of certain services for, or the provision of information, to the teammate. Services or information to be furnished shall be delivered directly between teammate on such terms and conditions as the teammates determine necessary that each may discharge the contractor's obligations to the Government under the contract. The Government shall assume no obligation for late or deficient services or information.

d. In the event that either teammate gets ahead or behind the other teammate in progress toward accomplishment of the objectives of this contract, it is the responsibility of the contractor to return the teammates to parity. LRIP II hardware will not be accepted from either teammate in advance of the other unless specifically approved in writing, in advance, by the Contracting Officer.

e. It shall be a specific management responsibility of the contractor team to maintain the schedules of each constituent member at parity. The Government shall not consider that any milestone has been met or that any test is ready to be conducted unless both contractor teammates are, simultaneously, fully ready to participate in the event.

f. Each teammate is obligated to institute a vigorous and aggressive Could-Cost Program. Therefore, the contractor shall establish, as part of the written agreement as referenced in paragraph a above, a could-cost agreement between the teammates. The agreement will provide for the respective teammates' could- cost goals and objectives and appropriate sharing arrangements for generated cost savings for goal achievement.

g. The teaming agreement shall contain the contractor agreement for AAWS-M technology transfer. The teaming agreement shall form Attachment 19 to this contract and shall be followed throughout the period of this contract and throughout the period of performance of any of the options exercised hereto. The teammates agree to transfer relevant data, manufacturing methods, manufacturing processes, trade secrets, or any other relevant intellectual material between the parties. The technology transfer agreement shall also describe how the technology-transferring member of the team will ascertain the progress of the technology-receiving member and how such progress shall be demonstrated to the Government. Revisions shall not be made to the teaming agreement without first obtaining the approval of the Contracting Officer in writing. All approved revisions shall be incorporated into the agreement. It is expressly agreed by the parties to this contract that such revisions to the teaming agreement shall not be considered as changes entitling the contractor to an equitable adjustment in time, cost of performance, or any other provision of this contract. Both teammates shall agree to these provisions and provide a copy of the teaming agreement to the Contracting Officer. The teaming agreement shall be maintained current at all times, and progress of technology transfer shall be reported at Program reviews.

H-9 END ITEM COMPETITION.

The FSD contractor shall complete AAWS-M development and achieve status of two independent, qualified sources for system production by the end of LRIP I. A minimum of two independent qualified sources shall be established for each critical item during LRIP I and shall be maintained through LRIP II. The team shall produce 100% of all hardware with each teammate producing a minimum of 10% of the production quantity of Rounds and CLUs and associated ancillary hardware such as consumables and containers for end items during LRIP I. During LRIP II, each teammate shall produce 50% of the production quantity of Rounds, CLUs, and associated ancillary hardware as defined above. (Training devices and other end items such as test program sets, technical manuals, and long lead items are excluded from these percentage limitations.) For quantities that cannot be evenly divided (odd numbered quantities), the contractor may assign the odd unit to either teammate. The term "produce" is defined as final assembly and acceptance test of end item assemblies. The apportionment of manufacture versus purchase of piece parts shall be the responsibility of the team. The joint use of a production facility during LRIP I and II is prohibited at the prime contractor level.

H-10 AWARD FEE PROVISION (ENGINEERING SERVICES).

1. The contractor's performance hereunder shall be evaluated for the purpose of determining the amount of award fee to be paid to the contractor. The maximum award fee (base fee plus potential fee) is 10 percent of estimated cost (excluding cost of money). The evaluation shall be performed by an evaluation board applying the criteria set forth in Attachment 15 here to. A Technical Manager shall be assigned by the Government to each Base-ESM for the purpose of monitoring the contractor's performance and assisting the Board in performance of its evaluation.

2. Each performance period to be evaluated covers 6 months of Engineering Services effort: The first performance period ends 6 months after option exercise. Subsequent periods end each 6 months thereafter.

3. Within twenty-five (25) days after the end of the evaluation period, the contractor shall submit, (with his monthly engineering accomplishment report, DI-MGMT-80061), a financial summary covering the evaluation period and a justification of the variations in planned-versus-actual man-hours and cost.

with DOD 4145.26M for privately owned, privately operated (POPO) contractor facilities and DARCOM Regulation 385-100 (Safety Manual) for Government-owned, contractor-operated (GOCO) facilities. If these facilities are owned by military services other than the Army, their safety regulations may be substituted for DARCOM 385-100.

H-16 COULD-COST SHARING

a. The contractor's share of could-cost savings shall be provided as additional fee. After adjustment of the contract target cost, target fee/profit and total cost for CLIN 0001, 0002, 0005, 0007, 0018 or 0020 for any could-cost proposal implemented by the Government, the target fee or profit will be increased to reflect the contractor's share of the savings. For CLIN 0001 or 0002 the fee will be increased by twenty-five percent (25%) of the total negotiated cost savings and for CLIN 0005, 0007, 0018, or 0020 the profit will be increased by forty percent (40%) of the total negotiated cost savings.

b. Firm-fixed-price CLINs will be reduced by sixty percent (60%) of the total negotiated cost savings resulting from could-cost proposals applicable to these CLINs and implemented by the Government.

H-17 PRODUCTION SPECIAL TOOLING/PRODUCTION SPECIAL TEST EQUIPMENT (PST/PSTE)

a. Production Special Tooling and Production Special Test Equipment are those subsets of special tooling and special test equipment (as defined in FAR 45.101) that support production rates and quantities for LRIP I.

b. The contractor agrees that the price of the option for LRIP I includes not less than fifty (50) percent of the full acquisition cost of any Production Special Tooling/Production Special Test Equipment (PST/PSTE) acquired for performance hereunder. The contractor further agrees that costs incurred by the contractor for the acquisition and fabrication of the PST and PSTE shall be direct charges to the instant contract. If the instant contract does not provide for payment of the maximum amount specified for the PST and PSTE, the balance of these costs shall not be shifted, assigned to other programs, or charged to indirect cost pools. Nothing contained herein shall be construed as making unallowable any deferred PST/PSTE costs.

c. The total amount of PST/PSTE acquisition costs to be paid (allowable and allocable) for LRIP I is $(*) which sum represents 100 % (this figure cannot be less than 50%) of total PST/PSTE acquisition cost. The remaining portion $(0) shall be deferred and allocated to the LRIP II Option. The maximum amount the contractor may be paid on the instant and future contracts for the LRIP I PST and PSTE is $ 8,190,000 .

The Government may accelerate the amortization schedule without penalty.

d. Any rental/asset charges paid to the contractor for the use of the PST/PSTE for Foreign Military Sales shall be applied as a reduction to the PST/PSTE acquisition costs paid by the U. S. Government.

e. Facilities capital cost of money will be calculated IAW CAS 414 and treated as a direct cost for each subsequent production year. Facilities capital cost of money shall be non-profit/fee bearing.

f. The Government's right to title to PST and PSTE shall be determined IAW FAR Subpart 45.3.

g. In the event the contract or program is terminated before the maximum amount specified for the PST and PSTE has been paid, for reasons other than the contractor's failure to perform, the contractor shall be paid the balance of the maximum amount or the actual amount incurred, whichever is less, subject to availability of appropriated funds.

h. In the event of termination for default, the contractor shall not be entitled to recoupment of any unamortized PST/PSTE costs.

i. The following is a listing of the PST and PSTE which the contractor will acquire or fabricate to perform LRIP I:

(List all PST/PSTE or refer to a listing which can be incorporated into the contract by separate attachment).

REFER TO: Volume 3, Cost/Price, Section 1.0.2

*Offeror may propose a single amount for each blank or propose three amounts (one for each of the low, middle, and high ranges for the rounds and CLUs under CLIN 0007.

MISSILE

	LRIP I	(%)	LRIP II	TOTAL
Low range	$3,218,000	(100)	0	$3,218,000
Middle Range	$4,985,000	(100)	0	$4,985,000
High Range	$5,790,000	(100)	0	$5,790,000

CLU

	LRIP I	(%)	LRIP II	TOTAL
Low range	$2,400,000	(100)	0	$2,400,000
Middle Range	$2,400,000	(100)	0	$2,400,000
High Range	$2,400,000	(100)	0	$2,400,000

H-18 SPECIAL NOTICE - NONCOMPLIANCE. This contract imposes upon the contractor a material requirement to establish and maintain two independent sources for the system and for critical items. The contractor shall immediately provide written notice to the Contracting Officer if at any time during performance of this contract (to include options if exercised), the contractor is not in compliance with the requirement for two independent sources. If within 120 days after issuance of the above notice the contractor has not cured his noncompliance, the Government shall be entitled to demand delivery, at no cost to the Government, of a Government Purpose License Rights TDP (as described in CLIN 0029) for the system or the critical item(s) for which the contractor has failed to maintain or establish two independent sources. This right is in addition to any other rights or remedies provided by law or contract to which the Government is entitled.

is available from CACI, 3344 North Torrey Pines Court, La Jolla, California 92037; Telephone No. (619) 457-9681.

b. Prepare an appropriate benchmark program for the AAWS-M system. The benchmark may be based on an instruction mix for such considerations as coordinate transformation, Fourier transform in integer add, Kalman filters and interrupt response time in Ada. Compile and run the benchmark program on the proposed compiler/computer pair. Preform the benchmark program both with the use of Ada pragmas as desired and with no pragmas utilized. Include results of the benchmark runs in the proposal. Innovation in the formulation of the benchmark, and meaningful metrics for the results is encouraged. As a minimum the results shall include the time for execution of the benchmarks and compile ratio of object instructions to higher order language instructions. Submit, on a 5 1/4 inch DSDD floppy diskette, the benchmark source code and machine code produced by the compiler.

c. The computer resources margin and growth requirements are important. Provide analysis and data demonstrating proposed compliance with spare memory, processor throughput, I/O, and interrupt capability.

d. Provide results and conclusions from existing trade studies, and risk analysis discussing alternative system architectures, optimization methods/plans, additional benchmark tests, and other design considerations relative to selection of proposed computer resources.

Part 4. Software Support Environment

a. Describe in the proposal the Development Software Support Environment Plan (DSSEP) to be used in the AAWS-M system software development as defined in DOD-STD-1467 Paragraphs 4.1, 4.3, 5.1, 5.1.2, 5.1.3, 5.1.6, and IAW DI-E-7140. Include identification of all software and executing hardware and address the sources (for example, commercially available, contractor proprietary, or developed with government funds). Describe in the proposal the Life Cycle Software Support Environment (LCSSE) IAW DOD-STD-1467 Paragraph 5.3 and subparagraphs, and describe and justify the differences between the DSSE and LCSSE IAW Paragraph 5.1.5.

3. Volume 3. Cost/Price. Provide the following information without constraint on page count. A copy of Volume 3, Cost/Price, shall be provided to the cognizant Defense Contract Audit Agency element concurrent with submittal of proposals.

Volume 3, Section 1, Cost/Price for LRIP Options. Propose a Not to Exceed (NTE) price in then year dollars for CLINs 0005 through 0029 and complete cost information through Level 2 of the WBS for CLINs 0013, 0014, 0022 and 0023. The NTE prices will be definitized prior to exercise of the option by the Government and shall be subject to downward negotiations only. The Offeror is not required to indicate a total price for option which contain range quantities. The Offeror shall indicate a unit price applicable for the exercise of any quantity within that range. Total price will be determined by the quantity exercised by the Government.

Volume 3, Section 2, Cost/Price for FSD. Complete cost information through Level 4 of the WBS is required for CLIN's 0001 and 0002. Costs shall be fully explained, as to rationale, methodology, data used, and in sufficient detail to demonstrate to proposal evaluators the total cost to the Government and any additional cost to the contractor. The offeror shall submit four (4) copies of the Bill-of-Material. Cost information for major subcontractors (over $500,000) not selected through price competition shall be provided in the same detail as required for the contractor. Also, the contractor shall perform cost/price analysis of subcontractor's proposals when initially submitted to the Government. All costs shall be presented IAW DA PAMs 11-2 through 11-5 and DCA-P-92(R). The above instructions are not intended as restrictive or all inclusive. Offerors are encouraged to submit any other cost and financial information considered to be helpful in the evaluation of the cost proposals. The supporting cost information (which shall be provided in separately bound appendices) shall include the following type information:

a. Rationale followed in development of quantitative estimates (labor and materials).

b. Subcontract cost, contract structure and principle components to be subcontracted.

c. Rationale followed in development of other direct costs, if any, such as tooling, relocation, plant rearrangement, travel, etc.

d. Listing of proposed Special Tooling/Special Test Equipment (ST/STE) required for Limited Production, and supporting data for cost estimates of same.

e. If the contractor proposes use of Government owned production and research property or any other Government furnished services/support/equipment/property, he shall provide the information required by FAR 45.205(b), (1), (2), (3) and (4). The offeror need only provide rental charges applicable to the production and research property.

Volume 3, Section 3, Could-Cost Proposal.

a. Provide a separate proposal for implementation of a could- cost program. The purpose of the program is to reduce contract costs and effort by reduction of non value added requirements wherever practical. Therefore, in addition to submitting a full and responsive proposal against the RFP as written, offerors are required to propose, as priced options, changes to any aspect of the RFP which can be demonstrated as (1) NOT mission essential, and (2) NOT the most cost-effective approach to contract performance.

b. This invitation to challenge the provisions of the RFP extends to both the business and contractual aspects as well as the technical aspects. In this context, provisions which an offerer satisfactorily demonstrates as meeting the three criteria stated in (a) above are not considered Government "requirements" within the meaning of FAR 15.606. The Contracting Officer will not be obligated to reveal to all offerors changes resulting from acceptance of a given offeror's option proposal if doing so would reveal to the other offerors the solution proposed by the given offeror or any other information that is entitled to protection.

c. Following are examples of areas where could-cost reductions might be achieved: These include (1) Reviewing

Standards, with special emphasis on tailoring of standards and specifications, (2) Testing, (3) RAM, (4) Program Reviews, (5) System Audits, (6) Travel, (7) Cost Reporting, (8) Data, (9) Inspection, and (10) Reduction in Waiver, Deviations, and ECPs.

d. The following ground rules apply to the submission of the option could-cost proposal.

(1) Must be separately priced, showing cost and fee reduction, and documented with the rationale for the change and the specific change recommended.

(2) Must provide a clear benefit to the Government in terms of financial or schedule benefit, life cycle cost, improved quality, risk reduction, ease of use, or future flexibility.

(3) Must be a single, Government-selectable option, separately priced, individually exercisable by the Government, independent of the basic AAWS-M proposal.

(4) Changes selected will be included in the contract as NOT- LESS-THAN options to be exercised within the option exercise period specified by the offeror. The proposed option exercise period shall be at least 90 days from date of award of the FSD contract.

(5) Subsequent could-cost proposals may be submitted by the contractor at any time. If selected by the Government, the changes will be immediately negotiated and implemented or included in the contract as NOT-LESS-THAN options to be exercised within the option exercise period specified by the contractor. Could-cost proposals applicable to the LRIP options shall be valid as a minimum 90 days from date of award of the LRIP options.

e. Contractor's share of any could-cost reduction selected for implementation by the Government shall be provided to the contractor pursuant to Special Provision Clause H-16.

Volume 3, Section 4, Design-To-Unit Production Cost (DTUPC) and Design-To-Operations and Support Cost (DTOSC). Provide a DTC Plan which will address the following:

a. DTUPC Goals. Propose unit production goals with detailed rationale to demonstrate to proposal evaluators the achievability of the stated DTUPC goals. Include the methodology used to generate the proposed goals, assumptions made, data used and their source, and other information deemed useful to effective evaluation of the realism of the proposed unit costs. DTUPC costs shall be presented IAW DA Pamphlets 11-3 and 11-5 and Attachment 16.

b. DTOSC Goal. Submit detailed rationale to demonstrate to the Government how it will achieve the $1.9B O&S goal. DTOSC cost shall be presented IAW DA Pamphlets 11-4, 11-5, DCA-P-92(R) format and definitions and attachment 16.

c. DTC Management. Details of the proposed techniques for establishing DTC goals and controlling and explaining changes to the goals.

4. Volume 4, MANPRINT. Not to exceed 10 pages as follows:

Volume 4, Section 1. MANPRINT Program Plan. Submit the initial MANPRINT Program Plan addressing MANPRINT and all MANPRINT related activities. Discuss the approach to ensure that introduction of the system will not impact the current force structure, and that the system will be usable and maintainable by the required target audience Military Occupational Speciality (MOS).

Volume 4, Section 2. Cross Reference. The offeror shall submit a cross-reference index table showing, by MANPRINT domain, the volumes/sections in the overall proposal that address the requirements specified in the RFP.

5. Volume 5. ILS/R&M/QA: Not to exceed 200 pages.

Volume 5, Section 1. Integrated Logistics Support (ILS): Not to exceed 50 pages as follows:

Part 1. ILS Planning. Submit a Master Integrated Support Plan (ISP) addressing all ILS activities in this RFP and interim contractor support planning (to include transition to organic support), Test Program Set (TPS) development, CLU retrofit, logistics demonstration and depot support. These activities will correspond to planned hardware development and testing activities. Address both U.S. Army and U.S. Marine Corps (USMC) support requirements. Address ILS management and organization activities including the identification of responsibilities and authorities of all ILS management personnel. Describe the interface and approval levels of ILS elements with the other program elements (e.g., design engineering, R&M, MANPRINT, and QA). Identify integration procedures of ILS elements with each other, as well as, the continued ILS integration into the hardware design process. Provide details of the proposed life cycle support concept throughout the accelerated system development, testing, deployment, and sustainment.

Part 2. Logistic Support Analysis (LSA). Submit a LSA plan addressing all LSA activities in this RFP. Provide results of a testability trade study documenting the tradeoffs made in determining the testability features of the design. Provide results of a trade study evaluating the feasibility of complete elimination of field maintenance for the system.

Part 3. Maintenance Concept. Provide a proposed maintenance concept for the CLU.

Part 4. Training. Demonstrate that the system operator and maintainer can be trained to the required level of proficiency in MIS 37300 for initial and sustainment training. Demonstrate that training devices will allow effective transfer of skills to the operator for use in the operational unit, in the force-on-force environment, and for institutional and sustainment training. Demonstrate also that little instruction is needed to train military personnel how to operate, maintain at unit level and correctly use the training devices.

Volume 5, Section 2. Reliability and Maintainability (R&M). Not to exceed 75 pages. Submit details explaining the development and implementation of R&M programs that will ensure (1) the capability to achieve R&M specification requirements is designed into FSD and production hardware, and (2) R&M characteristics improve and do not decay during the transition into production and (3) problems encountered in the R&M area will be handled in a manner which will prevent recurrance. Submit a

(c) Acquisition/Engagements. The probability of the gunner, using the system, recognizing and engaging all threat targets under all battlefield conditions and environments.

(d) Range. The required system range performance, the minimum and maximum effective range, and flight profiles.

(e) Training Device Fidelity. Training realism of the training system to replicate the weapon system functions and satisfy the specification requirements.

(2) Survivability/Safety. Address both the equipment and the gunner, with the survivability of the gunner being more than twice as important as the equipment. The assessment of this element will include the offeror's evaluation of health hazards and safety and will address the offeror's manrating approach. The factors to be evaluated include:

(a) Engagement Timelines. These include consideration of employment time, exposure time, time of flight and reload time.

(b) Firing Signature. Blast, toxicity levels, smoke, noise, benefit of soft launch, and the presented area of the gunner while firing.

(c) System Flexibility in accommodating maximum number of tactical firing positions and the ability to fire from enclosures.

(d) Hardware survivability will be measured against ballistic protection, exposure to High Altitude Electromagnetic Pulse, radiation, blast effects and resistance to the elements.

(e) The use of insensitive munitions.

(3) Portability/Human Factors Engineering. The factors of portability and human factors engineering are of equal importance. The combination of portability and human factors engineering is significantly more important than delivery. The factors to be evaluated include:

(a) Portability. This factor will consider total system weight, ease of carry of the assembled system, ease of carry of system components carried separately, system configuration and balance, and the ability to carry required accessories/expendables.

(b) Human Factors Engineering. The ease and speed of system utilization by the gunner through simple controls and switches and simplicity of the gunner mating the missile to the CLU, and ease of assuming all firing positions under all operational conditions including full NBC protective ensemble, ruggedness and usability.

(c) Delivery. Tactical system delivery by a parachutist and transportability in all types of tactical vehicles.

(4) Design Risk. The maturity of the overall system design as evidenced by the test results in the Proof of Principle Program. In evaluating this element, proposed designs which are different from those demonstrated in the Proof of Principle Program must be fully justified and supported by additional testing, similarity to existing hardware, and/or detailed engineering analysis. Factors which will be evaluated in this area include the following:

(a) Command and Launch Unit (CLU). The day/night sights, controls, reticle and displays, beam projector and tracker (if required), and accessories.

(b) Round Design. All major design components of the missile (propulsion, warhead, G&C, etc.) and the launch tube (end caps, etc.).

(c) System Interface. The electrical and mechanical interface designs between the CLU and round, including the consumables and their attachments.

(d) Environmental Capabilities. Both natural and induced environmental effects on the system, i.e., temperature extremes, weather, shock and vibration.

(e) Pre-planned product improvements including growth potential and modularity of the system design.

(f) Producibility at rate as evidenced by the design used in the POP Program.

b. Cost/Price. The Government will evaluate the most probable cost/price to the Government. The cost/price elements are as follows:

- LRIP Option II Cost/Price (CLINs 0018-0028)
- Full Scale Development Cost/Price (CLINs 0001-0004)
- LRIP Option I Cost/Price (CLINs 0005-0017)
- ✓ – Could-Cost Proposal Savings
- Design to Cost Goals

The sum of the LRIP Option elements are approximately twice as important as the FSD element and the sum of these elements are significantly more important than the remaining two elements. The Could-Cost element is significantly more important than the DTC element.

(1) LRIP Options.

(a) NTE price for LRIP II production (to include long lead time items, end items, interim contractor support and training) and most probable cost and base fee for engineering services. In evaluating the range options, the Government will utilize the not-to-exceed unit ceiling price proposed times the minimum range quantities as shown in Section B.

(b) NTE price for LRIP I production (to include long lead time items, end items, new equipment training, technical manuals, interim contractor support), most probable cost and base fee for engineering services and the total acquisition cost for production Special Tooling/Production Special Test Equipment (PST/PSTE). In evaluating the range options, the Government will utilize the not-to-exceed unit ceiling price proposed times the minimum range quantities as shown in Section B.

(2) Full Scale Development (to include the training devices).

✓ (3) Could-Cost proposal savings.

(4) Design to Cost. The contractor's DTC goals (DTUPC and DTOSC) and the management plan to achieve those goals.

APPENDIX C.

B-2 CONTRACTUAL DOCUMENTS

APPENDIX C.

B-2 CONTRACTUAL DOCUMENTS

This appendix is composed of the following documents:

INDUSTRIAL MODERNIZATION INCENTIVES PROGRAM (IMIP) BUSINESS DEAL

(U) BASIC MEMORANDUM OF AGREEMENT (MOA)

I. (U) PURPOSE

(U) This Business Agreement between the United States Air Force, Aeronautical Systems Division, B-2 System Program Office (SPO), hereafter referred to as "Government", and Northrop B-2 Division, hereafter referred to as "Contractor", is to establish investment criteria, objectives, definitions, incentive payment methodologies, procedures and savings sharing arrangements, and cost tracking of individual projects in the B-2 Industrial Modernization Incentives Program (IMIP). This MOA consist of the following:

a. IMIP Basic MOA (Contemplates Government Funding)
b. Appendix I - Subcontractor IMIP
c. Addendum Regarding Contractor Funded Projects

II. (U) DEFINITION

(U) IMIP is a joint effort of the Contractor and the Government designed to provide incentives to improve the production process with the overall objective of improving productivity and reducing weapons system costs. IMIP consists of three phases:

Phase I - Program Cost-Driver Analysis
Phase II - Detail Design, Development and Demonstration
Phase III - Implementation of New Technology/Equipment

A. (U) Phase I - Phase I of IMIP consists of a program analysis wherein existing methods are reviewed and candidate IMIP projects are identified and proposed for Phase II development. Preliminary financial analysis is performed for each project to determine the

feasibility of initiating Phase II projects. The savings values will be revised during Phase II and determined during Phase III. Costs incurred for Phase I projects funded by the Contractor shall be charged as indirect costs and recoverable as normal overhead.

B. (U) Phase II - Phase II of IMIP is the development of those projects identified in Phase I. It includes preliminary design, detailed design, prototype development, and demonstration of the new technology or process. Prototype equipment procured with Phase II funds may, if appropriate, be used in Phase III. IMIP Phase II projects require Government funding to help develop new technology or adapt existing technology to program-specific requirements. Potentially, there will be two types of Phase II projects - Modernization Investment Projects (MIPs) and Modernization Efficiency Projects (MEPs). These two types of projects may have different methods of calculating Contractor incentives. The financial incentives and the contract adjustment applicable to Phase III implementation of IMIP projects are set forth in Productivity Savings Reward (PSR) payment, Section IV below. All Phase II projects are subject to Government approval, and will be contractually implemented.

1. (U) Internal Rate of Return (IRR) Calculation

(U) Before Phase III is contractually authorized, PSRs will be negotiated on the basis of providing the Contractor an acceptable threshold based on the Contractor's after-tax cash flow. The government must, after approving the contractor's required PSR, have a satisfactory return using its specific criteria defined below. The negotiated Contractor MIP threshold will be based on the following formula in order to meet the needs of a long-term program. MEP project thresholds shall be negotiated on a project-by-project basis.

(U) Contractor Criteria - The Contractor's threshold for each IMIP project will be based upon the Northrop Corporate Finance Manual 3-103 (currently 12.5% IRR) plus a negotiable factor to account for peculiar technical and/or financial risk of a project (in the range of 2.5 - 12.5%).

(U) The above range represents an increase of 2.5%, to the previous range, in consideration for excluding lost profit as a variable when calculating Internal Rates of Return. Lost profit is defined as that profit not realized on follow-on B-2 Contracts because of reductions in cost resulting from a cost reduction initiative project(s).

(U) Government Criteria - At the start of Phases II and III, after modeling the PSR payments to achieve the Contractor's threshold, the project must return to the B-2 SPO savings at least equal to a Net Present Value (NPV) of zero when discounted at the 30-year Treasury bond rate at the time the Contractor's incentives are calculated.

C. (U) IMIP Phase III

1. (U) IMIP Phase III follows Phase II and is the phase of IMIP wherein the technology and/or production/manufacturing process improvements resulting from earlier development efforts are implemented on the B-2 Production Program. Subject to the mutual agreement of the parties, Phase III may be accelerated to overlap Phase II on a case-by-case basis. All capital investments, and related Phase III implementation expenses, will be made by the Contractor.

2. (U) Capital assets acquired by the Contractor which meet the criteria for indemnification set forth in the B-2 contract clause entitled "Capital Investment Incentives" shall, subject to the limits of the cited clause, be included on the list of indemnified capital items in accordance with the procedures set forth therein. Request for asset indemnification must be made no later than the time of Phase III proposal submittal. The Contractor's threshold return on indemnified assets shall reflect the reduced financial risk resulting from indemnification consistent with "Contractor Criteria" above.

III. (U) PHASE II/III FUNDING AND INVESTMENT IN IMIP

A. (U) Government - In Phase II, Government funding for projects will be negotiated on a project-by-project basis. Prior to Government funding of Phase II, the Contractor shall include the expected level of investment necessary to implement the project in its capital budget planning process. This does not obligate the Contractor to fund projects which are mutually agreed to be technically and/or financially infeasible. Profit on in-house, Northrop B-2 Division, Phase II IMIP projects is not appropriate and will not be paid. However, profit is appropriate on the Northrop B-2 Division effort of managing the Subcontractors. This profit will be based upon the burdened direct labor costs of managing Subcontractor efforts. The dollar value of Northrop B-2 Division's management effort will be negotiated between the SPO and Northrop B-2 Division, and will be contractually implemented. Management of IMIP activities shall be treated as an IMIP project and funded annually based on proposals, and shall be authorized as a subline item in accordance with the provisions of Paragraph IV.C.3.(a) below.

B. (U) Contractor - The Contractor agrees to invest in modern, cost-effective equipment required to implement IMIP projects.

(U) Additionally, the Contractor agrees to the following:

1. (U) Contractor in Phase III will fund 100 percent of capital expenditures and commercially available software for all projects.

2. (U) If a project is financially acceptable as determined by the discounted cash flow model, and the level of capital required for implementation is within 120 percent of the amount projected at the start of Phase II, the Contractor shall normally implement the project. As a basic premise, it is understood that Government Phase II funding shall be returned to the Government should the Contractor fail to implement a project which is financially and technically feasible, and within the 120 percent investment ceiling. However, the Government shall consider the circumstances surrounding each unimplemented project. The amount of Phase II funding returned to the Government shall be equitable given the circumstances presented by the Contractor.

IV. (U) IMIP CONTRACT INCENTIVES

A. (U) Productivity Savings Reward (PSR)

1. (U) The portion of the IMIP savings (instant contracts)/cost avoidance (future contracts) earned by the Contractor is referred to as a Productivity Savings Reward (PSR). PSR is the additional incentive required to encourage the Contractor

to invest in capital equipment and related expenses and to achieve the project threshold. The PSR does not constitute fee within the meaning of 10 USC 2306(d).

2. (U) Two basic categories of Contractor projects qualify for PSR:

i. (U) Modernization Investment Projects (MIPs) are heavily dependent upon Contractor investment that can be capitalized. For MIPs, a threshold will be negotiated on a per-project basis. This PSR will be the additional incentive given to the Contractor to achieve the project threshold.

ii. (U) Modernization Efficiency Projects (MEPs) are projects which enhance Contractor productivity without requiring significant capital investment (i.e., projects funded by expense outlays). For MEPs, the Contractor's PSR will be based on the incentive required to achieve the project threshold, which may differ significantly from the threshold for a MIP. If the MEP has significant development or implementation cost, the PSR may be calculated using discounted cash flow, return-on-investment analysis. Conversely, if the MEP has little or no investment for the Contractor, PSR shall be calculated by using a percentage share of all B-2 Program Savings (Instant and Future) from the point of project implementation. The negotiated percent share shall be paid by contract for the life of the program.

iii. (U) The aforementioned thresholds shall be consistent with Attachment A, Cost Reduction Initiatives Discounted Cash Flow Ground Rules.

B. (U) Contractor Implementation Proposal (CIP)

(U) The Contractor shall submit a Phase III Contractor Implementation Proposal (CIP) to demonstrate that PSRs are required to make identified IMIP project implementations economically viable and beneficial for both the Government and Contractor. Supporting documentation shall include the following:

1. (U) Project Identification: Project(s) description and implementation schedule. Identification of capital equipment to be acquired, nomenclature, quantity, and cost of equipment. In addition, any development, installation, and validation costs or other expenses, whether or not capitalized, will be included in the CIP to the extent these costs are not otherwise allocable to the performance of any specific DOD contracts.

2. (U) Cost/Benefit Analysis: The cost/benefit analysis will document the overall economic and other effects of the project(s). The Contractor will identify the anticipated reduction in price attributable to improvements resulting from project implementation.

3. (U) IRR Analysis: An IRR analysis will be completed to demonstrate the economic benefits provided by new projects relative to their implementation costs. An analysis should be run including the PSR necessary (if any) to achieve a

project's threshold. The Aerospace Industry Association of America Discounted Cash Flow Model, capable of being run on an IBM PC (or compatible), will be used for this analysis.

C. (U) Calculating PSRs

(U) The Aerospace Industry Association of America discounted cash flow model is the primary tool for calculating the amount of PSR the Contractor will be eligible to earn. Any investment that can be capitalized or expensed in accordance with the Contractor's disclosed accounting practices is eligible for IMIP.

1. (U) PSR Payment Basis

(a) (U) Instant Contracts: Instant contracts are defined as those B-2 contracts already priced without incorporating IMIP improvements. Operational milestones, as referred to below, shall be dates determined on a project-by-project basis and shall be contractually documented by the contractual amendment which defines the requirements contemplated by this Paragraph IV.C.

(b) (U) Northrop B-2 Division will receive their PSR incentive award payment immediately upon execution of the contract modification reflecting the related cost reduction(s), with the goal of achieving the negotiated threshold as determined in accordance with Paragraph II.B.1 above. The PSR can only be paid out of IMIP projected savings/cost avoidances.

(c) (U) Northrop B-2 Division with the goal of achieving will propose to the Government the estimated savings from each project at the time of Phase III proposal submission. Upon achieving the operational milestone the value of instant contracts will be reduced, at the cost line, by the mutually agreed to amount of IMIP instant contract savings less the PSR required to achieve the negotiated threshold.

(d) (U) It is the goal of both parties to pay all PSR from instant contract savings immediately upon execution of the contract modification reflecting the related cost reduction(s), upon achieving each project's operational milestone. If this is not possible, the SPO will be informed as to the magnitude of potential PSR shortfall. The SPO may terminate any project which no longer meets original projections. Should the SPO decide to continue the project, any portion of the mutually agreed PSR not paid out of instant savings shall also be paid to the Contractor under a separate line item at the point of PSR award, and a special provision shall be incorporated which further adjusts the contract price at the operational milestone.

(e) (U) If the instant contract(s) being adjusted due to IMIP is an incentive type contract, ceiling value(s) will likewise be adjusted.

(f) (U) In the event other, non-B-2, contracts are impacted by IMIP projects performed under this business agreement, the following procedures will apply:

(1) (U) Instant Contracts (Non-B-2) - B-2 Division will estimate the savings on these contracts which result from B-2-sponsored IMIP projects. Upon agreement of these estimates, these savings will be included in the cash flow model as cash inflows to the Contractor. Revised PSRs will be calculated in accordance with Paragraph IV.C. and PSR payments adjusted accordingly.

(2) (U) Future Contracts (Non-B-2) - Future, non-B-2, contracts benefiting from an B-2-sponsored IMIP project, must be priced taking the IMIP improvements into account.

2. (U) Basis for Estimating Savings

(a) (U) The Contractor will propose at the end of Phase II estimated savings to be used in reducing instant contract costs based upon the most recent cost-benefit analysis. These estimates are subject to Government review and approval and to negotiation between the parties.

(b) (U) During Phase III, detailed tracking of actual savings and the accuracy of the savings estimates will not be required. The magnitude of actual savings shall not affect the amount of instant contract cost reductions accomplished under paragraphs IV.C.1(c), (e) and (f) above. It is expected that the Contractor will perform a self audit of actual savings in order to improve the techniques used to estimate savings on future projects.

3. (U) PSR and Project Payment Mechanics

(a) (U) Each project, when funded in Phase I or II, will become a subline item under a Contract Line Item called "IMIP Phase Projects." Each project will be separately priced. Costs incurred under "IMIP Projects" subline items shall be reimbursed to the Contractor at a most expedited rate through progress payments, or flexible progress payments as applicable.

(b) (U) The instant contract savings from each IMIP project will result in a reduction of contract line item costs for the production B-2 aircraft.

(c) (U) The PSR necessary to achieve the negotiated threshold for each project will be a subline item under a Contract Line Item called "IMIP PSR Incentive Payments." Each project's PSR will be separately calculated and contractually noted. This line item shall be fully billable as soon as the changed process is operational (upon achieving the operational milestone).

V. (U) TECHNOLOGY TRANSFER

A. (U) As part of the prospective proposal submission for each phase of a particular project, the Contractor shall identify the limited rights data to be used in the project which would restrict the transfer of project technology. The Contractor shall make available to interested parties reports, demonstrations, and information, except that which is subject to any proprietary or limited rights restrictions which may apply, facilitating the transfer of technology developed under a Government-funded IMIP project.

B. (U) Security considerations and the Security Guide governing the Senior Cejay program take precedence over technology transfer activities.

FOR THE CONTRACTOR:

_____ DATE: _____

Mark F. Miller
Manager, Contracts

FOR THE GOVERNMENT:

_____ DATE: _____

Kalman G. Tinka, III
Contracting Officer

(U) APPENDIX I -- SUBCONTRACTOR IMIP

I. (U) PREAMBLE

(U) The SPO and Northrop B-2 Program recognize that a successful IMIP program on the B-2 weapons system must actively involve subcontractors. It is the goal of both parties of this agreement to develop Government funded IMIP productivity improvements at subcontractor facilities. It is the intention of the Government to utilize Northrop B-2 Division as the prime contracting source consistent with the existing B-2 program contract relationships. However, the Government reserves the right to enter into IMIP agreements with B-2 Subcontractors of its choice. Northrop B-2 Division management of any Government/Subcontractor direct IMIP agreement, would be subject to separate negotiations.

II. (U) PHASE I

(U) Northrop B-2 Division shall identify candidate subcontractors, concentrating on the impact of an IMIP on B-2 costs, and propose to the SPO their inclusion into the IMIP program as appropriate. Funding for Phase I efforts at approved subcontractors is negotiable. Concurrently with the Phase I negotiations (or earlier), Northrop B-2 Division shall enter into a Business Arrangement covering the terms of the IMIP with the Subcontractor. Agreements are subject to the approval of the SPO.

III. (U) PHASE II

(U) Northrop B-2 Division shall include Phase II subcontractor proposals within the submission of its Phase II proposals if possible. Northrop B-2 Division is responsible for analyzing, fact-finding, and performing the required cost-benefit analysis of the subcontractor proposal. Northrop B-2 Divison shall require the subcontractors to

IV. (U) PHASE III

perform the same type of financial analysis of a candidate project as set forth in the body of this business agreement. The SPO retains the right of final approval of all projects.

(U) Northrop B-2 Division shall evaluate project implementation proposals submitted by the relevant Subcontractor, and ensure that projects meeting criteria established in the Northrop B-2 Division -Subcontractor business agreement are implemented. Project implementation is subject to SPO approval.

V. (U) IMIP CONTRACT INCENTIVES/SAVINGS

A. (U) The party making the IMIP Phase III investment, is entitled to incentive payments in order to achieve the negotiated return on investment. As in the case of Northrop B-2 Division investments, the SPO return on the IMIP project is covered by paragraph B.1 GOVERNMENT CRITERIA, in the MOA to which this Appendix is attached.

B. (U) The incentive payments will be made by the SPO, through Northrop B-2 Division, to the Subcontractor. Northrop B-2 Division will negotiate the specific terms of remitting the incentive payments with the Subcontractor subject to SPO approval. Incentive payments will be made out of savings at the point of subcontract cost reduction upon achieving each IMIP project's operational milestone by the subcontractor.

C. (U) The savings generated from the IMIP project at the Subcontractor will be passed through to the SPO by Northrop B-2 Division through an equitable reduction in the instant prime contract's target cost and ceiling price. Future contracts will be priced incorporating the results of IMIP projects at the Subcontractor. Specific methods for estimating and determining savings at the Subcontractors will be negotiated by Northrop B-2 Division with their vendors, subject to SPO approval.

VI. (U) MANAGEMENT OF SUBCONTRACTOR IMIP EFFORTS

A. (U) Northrop B-2 Division, via a contract with the SPO, will manage B-2-related IMIP Subcontractor efforts. This effort will include:

1. (U) Evaluation of candidate Subcontractors, negotiation of Business Agreements, and negotiation/management of Phase I efforts.
2. (U) Analysis of Phase II proposals, negotiating prices for Phase II proposals, performing financial analysis, and managing the Phase II performance of the Subcontractor.
3. (U) Analysis of the Phase II implementation proposal, negotiating the savings and incentives resulting from each IMIP project, ensuring the necessary capital investment is made by the Subcontractor, and performing audits to improve the estimation techniques for future projects.

B. (U) Northrop B-2 Division management of the subcontractors is subject to review by the SPO in accordance with the limitations presented in the Subcontractor IMIP statement of work contained in the LRIP contract.

ADDENDUM REGARDING CONTRACTOR-FUNDED PROJECTS

I. GENERAL

A. The purpose of this Addendum is to describe business arrangements and procedures applicable for proposed Producibility, Productivity and IMIP projects where the Government does not provide funding in the manner contemplated by the Producibility and Productivity initiatives, and the basic IMIP MOA.

B. Except as otherwise expressly provided herein, this Addendum supplements the basic IMIP MOA to allow for a broader spectrum of projects (Producibility, Productivity and IMIP) to be pursued in the absence of Government funding. The spectrum of projects for Producibility, Productivity and IMIP initiatives hereinafter will be referred to as the Addendum IMIP MOA or IMIP Project. If conflicts are found between this Addendum and the basic MOA in the circumstances described in I.A. above, the provisions of this Addendum shall apply.

C. The parties hereby acknowledge that the Phase II development and Phase III implementation costs for Producibility and Productivity projects are subject to reimbursement when funded by the Contractor. The method of reimbursement shall be through negotiated PSR payments. Specifically, the costs are included in the return on investment analysis for calculating PSR and deducted from the sharing base prior to the application of the share ratio under MIP and MEP business scenarios, respectively.

D. The basic IMIP Memorandum of Agreement (MOA, dated 26 May 87) contains references to adjustments in the target cost, price and ceiling price for the instant contracts. For purposes of the basic MOA, the appendix to same and this addendum, all references to adjustment in instant contracts will be at the cost line with no adjustment to profit. The adjustment to the instant contract will be the mutually agreed amount of instant contract savings less the PSR. If the instant contract is an incentive type contract, the ceiling shall also be adjusted.

E. It is the further purpose of this Addendum to recognize the following:

1. That the Government has advised there will be cases in which it will be unable to provide funding in the manner contemplated by the Producibility and Productivity initiatives, and the basic MOA.

2. That the Government requested the Contractor to develop and propose innovative alternative means by which to permit IMIP/Producibility/Productivity projects to be pursued.

3. That it is the parties intent to preserve the concept of rewarding the contractor for conceiving, developing and executing IMIP/Producibility/Productivity projects which benefit the Government.

4. That in the absence of Government funding, it is appropriate that rewards be increased equitably to provide enhanced incentives to the Contractor to fund IMIP/Producibility/Productivity projects when Government funding contemplated for the Producibility and Productivity initiatives and the basic IMIP MOA is not available.

5. In the event Northrop B-2 Division funds Phase II of projects at their subcontractor(s), Northrop B-2 Division shall be entitled to retain a portion of the flow-through cost savings resulting from the implemented technology for reimbursement of Northrop B-2 Division's investment and incentive. The contractor portion shall be reflected in an enhanced incentive comparable to the range sited in II.A.2. below. Since Northrop B-2 Division would not provide for capitalized assets at its subcontractor, Northrop B-2 Division shall perform a Net Present Value Analysis to determine the PSR necessary to achieve the range referenced above.

6. That the provisions of this Addendum rely upon and are contingent upon the Government's funding of Contractor IMIP management in the manner prescribed by paragraph III.A. of the basic IMIP MOA.

7. That factors such as costs, schedules, economic changes, program changes and the like represent too uncertain a baseline affecting both parties to permit the establishment of binding standard methodology for the purposes of project proposals and negotiations. Project-by-project proposals in consonance with the basic IMIP MOA will be the basis for project definition and contractual definitization.

II. Business Agreement

A. General

1. Projects subject to this Addendum include, but are not limited to, projects of the kind described in the basic IMIP MOA as well as Producibility and Productivity related projects.

2. The procedure for calculation of Internal Rates of Return (IRR) as set forth in paragraph II.B.1 of the basic IMIP MOA shall be used by the Contractor in assessments of projects with the following modification. The Contractor's project threshold is based upon Northrop's current Corporate Finance Manual 3-103. The additional negotiable factor to account for peculiar technical and/or financial risk of a contractor funded project is normally in the range of 15.0 - 25.0 percent notwithstanding the Government and Contractor's right to negotiate outside the range on a case-by-case basis.

3. Contractor project proposals submitted in accordance with the provisions of the Addendum shall be consistent with the instant contract type.

4. Proposals contemplated by 3 above shall define cost, Productivity Saving Reward (PSR), price and reimbursement arrangements applicable to the project involved, including but not limited to: the Contractor's planned investment, estimated implementation costs, related schedules, cost reductions applicable to the instant contract(s), savings on all contracts which would benefit from the project and the required project return as defined in paragraph II.A.2. above. Such proposals shall also define the process by which, and the schedule upon which, the Contractor proposes to be paid PSR.

5. Except as may be otherwise agreed by the parties in writing, no project shall be initiated until that project and the financial arrangements applicable thereto have been negotiated and definitized by contractual incorporation. Direct costs, exclusive of program management costs, incurred pursuant to this Addendum by the Contractor and participating subcontractors prior to definitization in connection with projects which are not finally definitized, shall be allowable direct costs under the contract and shall be excluded from allowable costs considered in calculations of incentive fee thereunder and shall be excluded from costs considered in reference to the ceiling price thereof; indirect costs so incurred by the Contractor and participating subcontractors shall be allowable and allocable to contracts in accordance with established procedures.

6. Indemnification of capital assets acquired in connection with projects handled pursuant to the Addendum shall be in accordance with paragraph II.C(2) of the basic IMIP MOA.

7. Notwithstanding any provision of the contract, the basic IMIP MOA or this Addendum to the contrary, all costs (including PSR) which the Contractor and participating subcontractors are entitled to recover pursuant to this MOA shall, in the event of curtailment or termination as defined by the "Capital Investment Incentive" provision of the contract, be deemed allowable direct pre-termination/pre-curtailment costs and shall be paid promptly upon submittal of invoices for such costs; such costs shall be excluded from allowable costs considered in calculations of incentives thereunder and excluded from costs considered in reference to the ceiling price thereof.

8. In the event it is mutually agreed by the parties to terminate a project in Phase II or Phase III (for those projects not having a Phase II i.e., producibility or productivity projects) of same, the direct and indirect cost incurred will be reimbursed through increases in PSRs, on a dollar per dollar basis, of other projects upon definitization of a negotiated supplemental agreement.

9. Title to capital assets acquired by the Contractor and its subcontractors in connection with projects pursued in accordance with this Addendum shall remain with the Contractor, or with the affected subcontractor, except as otherwise provided by the contract clause entitled "Capital Investment Incentive" in connection with program curtailments and terminations; provided, however, the Contractor/subcontractor, at their option, may retain title to any such indemnified capital items, and equitable settlement arrangements concerning contractor/subcontractor retention of such assets shall be negotiated.

III. Definitization of IMIP/Producibility/Productivity Projects

A. Subject to paragraph II.A.5., 7., and 8. above, project proposals shall contain the following:

1. Project identification, statement of work, and development/implementation schedule.

2. Estimates of costs incurred (if any) and to be incurred to develop and implement the project including direct costs and estimated allocable indirect costs. These estimates are to be provided separately for instant contracts and other contracts expected to benefit from the project.

3. Estimates of savings applicable to the instant contract and other contracts expected to benefit from the project.

4. The ceiling price adjustment will normally equal 100 percent of the proposed project costs. However, the parties reserve the right to negotiate a ceiling adjustment up to 135 percent of the project cost on an exception basis. The Government increase in ceiling price for a proposed project represents a commitment by the Government to cover the project costs at a future date.

5. PSR required to allow the Contractor to recover the negotiated Project IRR will be determined through the use of The Aerospace Industry Association of America discounted cash flow model. In any year, PSR payments required to attain the negotiated Project IRR will not exceed the savings projected on any affected contract(s). Specific arrangements for PSR will be proposed and negotiated for each project proposal. The Government will generally allow payment of Contractor PSR out of instant contract savings. If instant contract savings is not sufficient to pay for PSR, then the unpaid portion of the PSR will be included as a line item in the follow on production buy with payment to be made promptly after definitization. Such payments will normally be made as annual lump sum payments with the first payment concurrent with definitization of negotiated reductions in the target cost of instant contract(s).

6. The Contractual handling of any special issues related to the proposed project such as, but not limited to: payments, increases in capital indemnification up to the FY 85 limit, curtailments/termination questions, proprietary rights in data and computer software and title.

7. A proposed plan for and schedules of Government payments to the Contractor.

IV. Contract Structure

A. To facilitate revised planning for funding of projects by the Contractor/Subcontractors in lieu of the Government, a new CLIN shall be established under which PSR payments shall be made. Existing contract provisions shall be revised as required to reflect the provisions of this Addendum, for example to reflect exclusion of certain costs from incentive calculations, to incorporate this Addendum, and to adjust contract costs as individual projects are definitized.

Mark F. Miller
Manager
Contracts

17 May 1989
Date

Kalman G. Tinka III
Contracting Officer

Date

COST REDUCTION INITIATIVES (CRI)
DISCOUNTED CASH FLOW MODEL GROUND RULES

IDEA	FUND DEVELOPMENT	DISTRIBUTION OF SAVINGS NORTHROP	SUBCONTRACTOR	B-2 PROGRAM
SUBCONTRACTOR ORIGINATED PROJECT	NORTHROP	37.5 - 27.5%	25 - 15% (CAPITAL)	NET SAVINGS
	SUB	----	37.5 MAX (DEV & CAPITAL)	NET SAVINGS
	GOVT	----	25 - 15% (CAPITAL)	NET SAVINGS
MIP				
NORTHROP ORIGINATED PROJECT	NORTHROP	37.5 - 27.5% (DEVELOPMENT & CAPITAL)	25 - 15% (CAPITAL)	NET SAVINGS
	SUB (OWN DEVLOP)	37.5 - 27.5% (NORTHROP DEV & CAPITAL AS APPLICABLE)	37.5 MAX (ON SUB DEV & CAPITAL AS APPLICABLE)	NET SAVINGS
	GOVT	25 - 15% (CAPITAL)	25 - 15% (CAPITAL)	NET SAVINGS
MEP*		INSTANT CONTRACT	FUTURE CONTRACTS	
NORTHROP PERFORMED				
NORTHROP PSR		NO TARGET COST ADJUSTMENT	25% NET SAVINGS	
SUBCONTRACTOR PERFORMED				
SUBCONTRACTOR		NO TARGET COST ADJ	25% NET SAVINGS	
NORTHROP		NO TARGET COST ADJ	0% NET SAVINGS	
GOVERNMENT		REMAINDER	REMAINDER	
SUBCONTRACTOR PERFORMED/NORTHROP FUNDING				
SUBCONTRACTOR		NO TARGET COST ADJ	25% MAX NET SAVINGS	
NORTHROP		37.5 - 27.5% (DEV COST)		

* WILL HANDLE THROUGH DCF MODEL IF PROJECT CONTAINS LARGE DEVELOPMENT COS[illegible]

SHEET OF

NTRACT DOCUMENT CHANGE NOTICE

DATE PREPARED

NORTHROP

NORTHROP CORPORATION
ADVANCED SYSTEMS DIVISION
9900 E. WASHINGTON BLVD
PICO RIVERA CA 90660

☒ PROPOSED
☐ APPROVED

PSCN NO | ITEM NO
PSCN NO | ITEM NO

REPORT NO	DCCN NO	RELATED ECP DCP NO
	92-CP-0005 R1	DCP SCI'F and FSI

CONTRACT NO	DOCUMENT TITLE AND NO
F1962?-87-C-2000	SPECIAL CONTRACT REQUIREMENTS

THIS NOTICE NOTIFIES RECIPIENTS THAT THE DOCUMENT IDENTIFIED BY THE NUMBER, REVISION LETTER, DATE AND TITLE SHOWN IN BLOCK 11 HAS BEEN CHANGED. THE PAGES CHANGED BY THIS DCCN ARE THOSE FURNISHED HEREWITH AND DATED THE SAME AS THIS DCCN. THE CONTRACT DOCUMENT CHANGE LOG ALSO FURNISHED HEREWITH REFLECTS THIS DCCN ACTION AND IS TO REPLACE THE LOG CURRENTLY IN THE DOCUMENT

REMOVE AND DESTROY DOCUMENT PAGES

Page 137 Part III List of Documents, Exhibits and other attachments

INSERT THE FOLLOWING DOCUMENT PAGES (ATTACHED HERETO):

Part I — Section H of the Schedule
H-61 Productivity Savings Reward (PSR) Sharing Ratio.

Part III — List of Documents, Exhibits and other attachments
Section J List of Exhibits.

Exhibit P - IMIP Projects Funding and PSR Payment Exhibits.

Exhibit Q - IMIP MOA and Addendum

CONCURRENCE SIGNATURE | UNCLASSIFIED | DATE

DSP-1068 (3-84)

CONTRACT DOCUMENT CHANGE LOG

NORTHROP

NORTHROP CORPORATION
ADVANCED SYSTEMS DIVISION
8900 E. WASHINGTON BLVD
PICO RIVERA, CA 90660

DATE _____

CONTRACT DOCUMENT NO F33657-87-C-2000

CDCN NO	ECP OR CCP NO	CONTRACTUAL AUTHORITY DOCUMENT	PARAGRAPHS AFFECTED
02-C2-0005R1	CCP 5011F and FS1		4-61

DSF-1610 (3-84) ***** UNCLASSIFIED *****

PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS

SECTION J - LIST OF EXHIBITS

DOCUMENTS	TITLE AND DATE
EXHIBIT A	LP CONTRACT DATA REQUIREMENT LIST
EXHIBIT B	CDRL FOR TECHNICAL ORDERS
EXHIBIT C	PROVISIONING DATA
EXHIBIT D	EXHIBIT FOR TCTO (Reserved)
EXHIBIT E	PRICED EXHIBIT FOR SUPPORT EQUIPMENT (Reserved)
EXHIBIT F	PRICED EXHIBIT FOR RETROFIT KITS (Reserved)
EXHIBIT G	PRICED EXHIBIT FOR REPAIR OF GFE (Reserved)
EXHIBIT J	SPECIAL STUDIES (Reserved)
EXHIBIT K	(Reserved)
EXHIBIT L	PRICE EXHIBIT FOR CFAE/CFE TECHNICAL ORDERS
EXHIBIT N	ENGINEERING DRAWING (Deferred)
EXHIBIT P	IMIP PROGRAM PROJECT FUNDING AND PSR PAYMENT EXHIBITS
EXHIBIT Q	INDUSTRIAL MODERNIZATION INCENTIVES PROGRAM MEMORANDUM OF AGREEMENT

PART I SECTION H OF THE SCHEDULE

H-61 Productivity Saving Reward (PSR) Sharing Factor

(U) (b) (3) The Industrial Modernization Incentives Program (IMIP) business agreement dated 26 May 1987 and the addendum dated 14 April 1988 and as revised 13 February 1989 is hereby incorporated by reference. Therefore, any reference to the IMIP business agreement shall be the aforementioned document. The agreement is contained in Exhibit Q, IMIP Memorandum of Agreement.

EXHIBIT P

IMIP PROGRAM PROJECT FUNDING AND PSR PAYMENT EXHIBITS

Exhibit P is for accountability of Project Development Costs and associated PSR under the IMIP/Producibility/Productivity Memorandum of Agreement. Exhibit P consists of the following:

Exhibit P - 1		Government Funded Projects
	P-1-1	Internal/Subcontractor IMIP Projects
	P-1-2	Producibility Projects
	P-1-3	Productivity Projects
Exhibit P-2		B-2 Division Funded Projects
	P-2-1	Internal/Subcontractor IMIP Projects
	P-2-2	Producibility Projects
	P-2-3	Productivity Projects
Exhibit P - 3		B-2 Division Subcontractor Funded Projects
	P-3-1	Subcontractor IMIP Projects
	P-3-2	Producibility Projects
	P-3-3	Productivity Projects

Following this page is a blank form for the above exhibits.

EXHIBIT Q

INDUSTRIAL MODERNIZATION INCENTIVES PROGRAM

MEMORANDUM OF AGREEMENT

DATED 26 MAY 1987 BASIC MOA

DATED 14 APRIL 1988 ADDENDUM TO BASIC MOA

DATED 13 FEBRUARY 1989 REVISION A TO BASIC AND ADDENDUM

EXHIBIT P-_____

PROPOSAL NUMBER	PROJECT NUMBER	DESCRIPTION	ESTIMATED SAVINGS	DEVELOPMENT PRICE	PSR INSTANT (I) FUTURE (F)	PROPOSAL ATTACHMENTS *

* The attachments contain a cost breakdown, statement of work and schedule by project.

COST REDUCTION INITIATIVES (CRI) BUSINESS AGREEMENT

(U) BASIC MEMORANDUM OF AGREEMENT (MOA)

I. (U) PURPOSE

(U) This Business Agreement between the United States Air Force Aeronautical Systems Division, B-2 System Program Office (SPO), hereafter referred to as "Government" and Northrop B-2 Division, hereafter referred to as "Contractor", is established to set forth the policies, groundrules and incentive parameters for Cost Reduction Initiatives (CRI's) on the B-2 Program.

(U) This MOA provides the basic framework for the CRI Program; however, this MOA does not preclude the parties from negotiating a separate business arrangement on unique CRI's that will have mutual benefits that may not be achievable under this MOA.

II. (U) SCOPE OF AGREEMENT

(U) The scope of this agreement encompasses cost reduction initiatives on the B-2 program including, but not limited to, Industrial Modernization Incentive Program (IMIP), Engineering Change Proposals, Contract Change Proposals, Productivity/Producibility Improvements and Overhead Reduction Programs.

III. (U) DEFINITIONS

A. Phase I Project Analysis - Phase I consists of initial program or project analysis through which potential CRI projects are identified and proposed for candidate Phase II development. Preliminary cost benefit analysis is performed for each project to determine the financial feasibility. Costs incurred for Phase I are allowable costs under current contracts, but will not be included in the cost base for determining productivity savings reward (PSR).

B. Phase II Development - Phase II encompasses the effort required to demonstrate that the product or service which may have been proposed in Phase I is technically feasible. Phase II development may include preliminary design, detailed design, prototype development, and demonstration of the new technology or process. Prototype equipment procured with Phase II funds may, if appropriate, be used in Phase III. Phase II projects may require Government, Contractor or Subcontractor funding or any combination thereof to help develop new technology or adapt existing technology to program-specific requirements. Potentially, there will be two types of Phase II project analyses - One based on an Internal Rate of Return and the other based on a percentage share of the net savings.

C. Phase III Implementation - Phase III encompasses the non-recurring effort of implementing a CRI project into the B-2 program. Phase III may be either Contractor, Subcontractor or Government funded or any combination thereof. Capital investments will be funded by the contractor or subcontractor.

D. Instant Contracts - The fiscal year production lots that are under contract at the time the savings are negotiated.

III. (U) DEFINITIONS (Continued)

E. Instant Contract Savings - For CRI's based on IRR analysis, Instant Contract Savings are determined by the gross cost reduction(s) on the contract(s) minus cost associated with incorporating the CRI (including PSR). All adjustments will be at the cost line. Profit /fee will not be adjusted downward as a result of the CRI. With respect to CRI's based on share analysis, the instant contract is not adjusted for savings.

F. Future Contract Savings - The gross cost reduction on the planned B-2 production contracts. Savings on logistics support or GFP are excluded from this calculation. Profit/Fee factor will normally be included when estimating Future Contract Savings.

G. Gross Savings - Total future Production Contract savings plus gross instant contract cost reduction.

H. Net Savings - Gross Savings less Phase II and Phase III costs and any applicable PSR.

I. Technical Infeasibility - The technology required to complete the project does not exist and cannot be developed within the negotiated time frame and resources.

J. Productivity Savings Reward (PSR) - PSR is the financial incentive paid to the Contractor for developing, implementing or investing in CRI's. The PSR does not constitute fee within the meaning of 10 USC 2306 (d).

IV. PRODUCTIVITY SAVINGS REWARD (PSR)

A. PSR is calculated on a Rough Order Magnitude (ROM) basis in Phase I and Phase II. The Phase III Implementation Proposal will provide firm PSR data to demonstrate that the CRI is economically viable and beneficial for both the Government and Contractor. PSR is normally negotiated prior to contractual implementation of Phase III. PSR is determined by two mutually exclusive methods. It is calculated on either an Internal Rate of Return (IRR) or a Share Percentage of the future net savings. The CRI Discounted Cash Flow Model will be used to calculate PSR. The DCF parameters are set forth in Attachment A. The groundrules and assumptions for the CRI DCF Model are contained in Attachment B.

B. Internal Rate of Return (IRR) - IRR analysis is used when the Contractor funds Phase II and/or Phase III projects that require *significant development costs and/or capital expenditures. The* PSR to the Contractor will generally be calculated based on an internal rate of return of the Contractors investment from the after tax cash flows of the B-2 production program.

C. Share Analysis - In the case where the Government funds a Phase II and/or Phase III project or where minimal Contractor funded nonrecurring costs/ capital expenditures are required, the PSR to the Contractor will be determined based upon a percentage of future B-2 contract(s) net production savings.

D. Concurrent Savings - The estimated savings on non B-2 contracts which result from B-2 sponsored CRI projects will be included in the cash flow analysis.

IV. PRODUCTIVITY SAVINGS REWARD (PSR) (Continued)

E. PSR Recovery - It is the goal of both parties to pay all PSR from instant contract(s) savings immediately upon execution of the contract modification for the related cost reduction(s). Any remaining PSR not paid out of instant savings shall be paid under a separate line item in future contracts at the point of prime contract award. This line item shall be fully billable upon award of the future contract(s).

G. Financial Feasibility

1. Contractor Criteria - The contractor's threshold for each CRI project will be based on the Northrop Corporate Finance Manual 3-103 (Currently 12.5% IRR) plus a negotiable factor to account for technical and/or financial risk of a project *(in the range of 15.0 - 25.0%)*
2. Government Criteria - At the start of Phase II and III, after modeling the PSR payments to meet the Contractor's threshold, the B-2 SPO must achieve savings at least equal to a Net Present Value (NPV) of zero when discounted at the 30-year Treasury bond rate at the time the Contractor's incentives are calculated.

V. CAPITAL INVESTMENTS

A. Capital investments will be funded by the Contractor.

V. CAPITAL INVESTMENTS (Continued)

B. If a project is financially and technically feasible and the actual capital expenditure required for implementation is within 120 percent of the amount projected at the start of Phase II, the Contractor shall normally implement the project. In the event the Contractor fails to implement a project which capital costs are within the 120 percent capital investment ceiling and has not been canceled by mutual agreement, the Government's funding shall be returned to the Government.

C. Title to capital assets acquired by the Contractor and its subcontractors in connection with projects pursued in accordance with approved CRI's shall remain with the Contractor, or with the affected subcontractor, except as otherwise provided by the contract clause entitled "Capital Investment Incentive" of the LRIP Contract.

VI. TRACKING OF SAVINGS

The Phase III proposal will include firm savings that are subject to negotiations between the parties. Detailed tracking or validation of actual savings shall not be required of the Contractor.

VII. SUBCONTRACTOR INITIATED CRI's

A. The Contractor shall include subcontractor proposals within the submission of its proposals where appropriate. The Contractor is responsible for analyzing, fact-finding, and performing the required cost-benefit analysis of its subcontractor proposals. The Contractor shall require its subcontractors to perform the same type of financial analysis of a candidate project as set forth in the body of this business agreement. The SPO retains the right of final approval of all subcontractor initiated CRI's.

B. The Contractor will negotiate with the Subcontractor, subject to Government approval, the specific terms of remitting the PSR payments.

VIII. B-2 PROGRAM TERMINATION/CURTAILMENT

In the event of curtailment or termination of the B-2 program, all allowable costs which the Contractor has incurred on approved CRI's are reimbursable costs which the Government shall pay promptly upon submittal of invoices for such costs. PSR will be negotiated and adjusted at the point of termination.

IX. PROJECT TERMINATION

In the event it is mutually agreed by the parties to terminate a specific project in Phase II or Phase III, the allowable cost incurred will be reimbursed by increasing the PSR, on a dollar for dollar basis, of other projects upon definitization of a negotiated supplemental agreement. In the event increasing PSR on other projects is not practical, the Contractor will be reimbursed pursuant to the "Termination for Convenience" clause of the contract, except that the total cost incurred shall constitute the Government's maximum liability.

X. OVERRUN OF CONTRACTOR FUNDED PROJECTS

PSR will be computed against the negotiated target cost. However, in the event the Contractor exceeds the negotiated target cost, the Government will reimburse the Contractor on a dollar for dollar basis, but only to the extent the Government deems that the project is technically and financially sound. The Government may reimburse the Contractor for the overage by increasing the PSR on a dollar for dollar basis or increase the target cost whichever method is appropriate.

XI. PROPOSAL REQUIREMENTS

Proposal preparation effort for an approved Phase II and/or Phase III CRI shall be considered an allowable cost to the Phase II or Phase III effort, as appropriate. Supporting documentation in the CRI proposals shall include the following:

1. Project Identification: Project(s) description and implementation schedule. Identification of capital equipment to be acquired, nomenclature, quantity, and cost of equipment. In addition, any development, installation, and validation costs or other expenses, whether or not capitalized.

XI. PROPOSAL REQUIREMENTS (Continued)

2. CBA Analysis: A Cost Benefit Analysis will be provided in the proposal to demonstrate the economic benefits provided by the CRI. The proposal will also include a DCF analysis reflecting the PSR necessary (if any) to achieve the Contractor's threshold.

XII. RETROFIT COST

Retrofit cost will generally not be included in the CRI DCF analysis. Retrofit cost, if any, will be provided as an option to the basic proposal with the assumption that the Government will fund the retrofit activity and provide the Contractor with a reasonable profit/fee.

XIII. CLASS II CHANGES

From time to time the Contractor will proceed with a CRI as a Class II change that would normally be processed as a Class I CRI requiring PSR. This procedure implements CRI's expeditiously to maximize program savings. A concurrent Class I proposal will be processed and subsequently submitted to the Government for approval. The Class II implementation by the Contractor shall not prejudice the Government review and approval of the related Class I proposal. All costs, including PSR and proposal preparation, are allowable costs under the appropriate contract.

XIV. DEFINITIZATION

The ceiling price adjustment will normally equal 100 percent of the projects target cost. However, the parties reserve the right to negotiate a ceiling adjustment up to 135 percent on an exception basis. The Government increase in ceiling price for a proposed project represents a commitment by the Government to cover the project cost at a future date.

XV. TECHNOLOGY TRANSFER

A. As part of the prospective proposal submission for each phase of a particular project, the Contractor shall identify the limited rights data to be used in the project which would restrict the transfer of project technology. The Contractor shall make available to interested parties reports, demonstrations, and information, except that which is subject to any proprietary or limited rights restrictions which may apply.

B. Security considerations and the Security Guide governing the B-2 program take precedence over technology transfer activities.

United States Air Force	Northrop Corporation
Jack W.Stackhouse, Major, USAF Contracting Officer	Robert A. Hosozawa, Manager B-2 Change Management

COST REDUCTION INITIATIVES (CRI)
DISCOUNTED CASH FLOW PARAMETERS

~~* PHASE II ANALYSIS~~ INCENTIVE SHARING

ORIGINATOR	FUNDER	TYPE	PRECEDENCE
SUB	SUB	IRR	1) SUB (37.5% MAXIMUM) 2) PRIME, IF PRIME IMPACTED (27.5-37.5%) - DUAL FUNDING
SUB	DOD	IRR	1) SUB (25.0% MAXIMUM ON CAPITAL) PRIME, IF PRIME IMPACTED (NORMAL PROFIT)
SUB	PRIME	IRR	1) PRIME (27.5-37.5%) 2) SUB (25.0% MAXIMUM ON CAPITAL)
SUB	SUB	SHARE	1) NO TARGET COST ADJ. ON INST. CONT. 2) PRIME, IF PRIME IMPACTED (27.5-37.5%) - DUAL FUNDING 3) SUB COST RECOVERY 4) SUB SHARING (25% MAXIMUM) - PER FY BUY
SUB	DOD	SHARE	1) NO TARGET COST ADJ. ON INST. CONT. 2) DOD COST RECOVERY 3) SUB COST RECOVERY 4) SUB SHARING (25% MAXIMUM) - PER FY BUY
SUB	PRIME	SHARE	1) NO TARGET COST ADJ. ON INST. CONT. 2) PRIME (27.5-37.5% IRR) 3) SUB COST RECOVERY 4) SUB SHARING (25% MAXIMUM) - PER FY BUY
PRIME	PRIME	IRR	1) PRIME (27.5-37.5%)
PRIME	DOD	IRR	1) PRIME (15-25.0% ON CAPITAL)
PRIME	PRIME	SHARE	1) NO TARGET COST ADJ. ON INST. CONT. 2) PRIME COST RECOVERY 3) PRIME SHARING (25% MAXIMUM) - PER FY BUY
PRIME	DOD	SHARE	1) NO TARGET COST ADJ. ON INST. CONT. 2) DOD COST RECOVERY 3) PRIME COST RECOVERY 4) PRIME SHARING (25% MAXIMUM) - PER FY BUY

DRAFT

ATTACHMENT B

CRI DCF GROUNDRULES AND ASSUMPTIONS.

1. The CRI DCF model is based on IMIP guidelines, AIA DCF model algorithms and is consistent with the terms and conditions of this MOA.

2. PSR payment against each fiscal year buy will not exceed the amount of contract savings available for that fiscal year buy.

3. The discount rate to calculate Government net present value is the 30 year U.S. treasure bond rate.

4. Government funded projects includes progress payment to the Contractor.

5. Inputs to the DCF model will be in then-year dollars.

6. No instant contract adjustment will be made for CRI's based on share analysis.

MEMORANDUM OF UNDERSTANDING (MOU)

CONTENTS

MEMORANDUM OF UNDERSTANDING (MOU)
COST REDUCTION INITIATIVES (CRI)

I. PURPOSE

This Memorandum of Understanding between 190A, hereafter referred to as "Buyer," and _____ hereafter referred to as "Seller," is to establish investment criteria, objectives, definitions, incentive payment methodologies, procedures and savings sharing arrangements of individual projects in the Subcontractor Cost Reduction Initiatives (CRI) Program, including Industrial Modernization Incentive Program (IMIP) projects. The United States Air Force, Aeronautical Systems Division, System Program Office (SPO), is hereafter referred to as "Government." Nothing in this MOU shall in any way establish or imply any privily of contract between the Seller and the U.S. Government.

II. DEFINITIONS

A. Subcontractor CRI

Subcontractor CRI is a program of Buyer and Seller implementing Buyer's prime contract CRI agreement with its Customer to provide incentives to improve the production process at its subcontractors with the overall objective of improving productivity, producibility, and reducing weapon system costs. Subcontractor CRI Program allows for IMIP, Productivity and Producibility projects and consists of three phases:

Phase I	-	Program Cost-Driver Analysis
Phase II	-	Detail Design, Development & Demonstration
Phase III	-	Implementation of New Technology/Equipment/ Change/Process

1. Phase I - Phase I of Subcontractor CRI consists of a program analysis wherein existing methods are reviewed and candidate Subcontractor CRI projects are identified and proposed for Phase II development. Preliminary financial analysis is performed for each project to determine the feasibility of initiating Phase II projects. The savings values will be revised during Phase II and determined during Phase III.

2. Phase II - Phase II of Subcontractor CRI is the development of those projects identified in Phase I. It includes preliminary and detailed design, prototype development, and demonstration of the new technology or process. Prototype equipment procured during Phase II may, if appropriate, be used in Phase III. Subcontractor CRI Phase II projects may require funding to help develop new technology or adapt existing technology to program-specific requirements.

   These projects may have different methods of calculating Seller incentives. The financial incentives and the contract adjustments applicable to Phase III implementation of Subcontractor CRI projects are set forth in Productivity Savings Reward (PSR) payment, Section IV below. All Seller CRI Phase II projects will be negotiated with Buyer and are subject to Government approval. Approved projects will be contractually implemented by modification to Buyer's contract with the Government and Subcontract with the Seller.

3. Phase III - Phase III normally follows Phase II and is the phase of Subcontractor CRI wherein the technology and/or production/manufacturing

process improvements resulting from earlier development efforts are implemented. Subject to the mutual agreement of the parties, Phase III may be accelerated to overlap Phase II on a case-by-case basis. All capital investments and related Phase III implementation expenses will be made by the Seller. Under Engineering-type changes, implementation costs (those over and above production baseline costs) will be given consideration.

B. Subtier CRI

Subtier Vendor CRI is an extension of the Subcontractor CRI program. The Seller is encouraged to search its subtier cost structure to identify subtier vendors for inclusion in Seller's CRI project submittals. It is the intention of the Buyer to utilize the Seller as the prime subcontracting source consistent with the existing program contract relationships. However, Buyer reserves the right to enter into direct CRI agreements with any Subtier Vendors of its choice. Subtier CRI consists of three steps corresponding, generally, to the three phases of the basic CRI:

Step I	Identification of potential Subtier Vendor participation
Step II	Receipt of Phase II Subtier Vendor proposals and negotiations
Step III	Implementation proposals and business agreements

1. Step I

The Seller shall identify candidate Subtier Vendors, concentrating on the impact of a CRI on their costs, and propose to each such Subtier Vendor its inclusion into the CRI program as appropriate. Funding for Phase I efforts at approved Subtier Vendors is negotiable. Concurrent with the Phase I negotiations (or earlier), the Seller shall enter into a Memorandum of Understanding (MOU) covering the terms of the CRI with the Subtier Vendors. The MOUs are subject to the approval of Buyer.

2. Step II

The Seller shall submit Phase II Subtier Vendor proposals. The Seller is responsible for analyzing, factfinding, and negotiating the Subtier Vendor proposals. The Seller shall require the Subtier Vendors to perform the same type of financial analysis of a candidate project as required of the Seller per paragraph II.A, above. Seller shall manage the Phase II performance of the Subtier Vendors. Buyer retains the right of final approval of all projects.

3. Step III

The Seller shall evaluate project implementation proposals submitted by the relevant Subtier Vendors, negotiate the savings and incentives resulting from each CRI project, ensure that the necessary capital investment is made by the Subtier Vendor, encourage the Subtier Vendor to perform self audits to improve the estimation techniques for future projects, and ensure that projects meeting the criteria established in the Seller-Subtier Vendor business agreement are implemented. The business agreement is subject to Buyer approval. The Seller's management of the Subtier Vendors is subject to review by Buyer.

C. Productivity Savings Reward (PSR)

1. The portion of the Subcontractor CRI savings (instant contracts)/cost avoidance (future contracts) earned by the Seller is referred to as a Productivity Savings Reward (PSR). PSR is the additional incentive required

to encourage the Seller to invest in capital equipment, related expenses, and fund the development phase to achieve the project threshold. The CRI Discounted Cash Flow Model is the tool for calculating the amount of PSR the Seller will be eligible to earn. Any investment in accordance with the Seller's disclosed accounting practices is eligible for CRI.

2. Two basic categories of Seller projects to qualify for PSR:

   a. Internal Rate of Return (IRR) analysis is the primary means to determine the amount of PSR that the subcontractor is eligible to receive. The IRR method applies to projects that require significant investment, and

   b. A percentage share of savings is the means to determine PSR for projects that do not require significant investment.

D. Internal Rate of Return (IRR)

Before Phase III is contractually authorized, PSRs will be negotiated on the basis of providing the Seller an acceptable rate of return based on the Seller's after-tax cash flow. This rate, the Hurdle Rate, in capital budgeting, is the minimum acceptable rate of return to insure the financial feasibility of a project.

For planning purposes, the Government must, after approving the Seller's required PSR through Buyer, have a satisfactory return using its specific criteria defined below. The Seller's internal rate of return will be based on the following criteria in order to meet the needs of a long-term program. Projects with little or no investment shall be negotiated on a project-by-project basis. Under an IRR analysis project, an additional factor to account for peculiar technical and/or financial risk of a Seller funded project will be negotiated on a case-by-case basis.

E. Seller Criteria

The Seller's hurdle rate for each CRI IRR Analysis Project will be based upon:

F. Government Criteria

At the start of Phases II and III, after modeling the PSR award to achieve the Seller's threshold, the project must return to the Government savings at least equal to a Net Present Value (NPV) of zero when discounted at the 30-year Treasury bond rate at the time the Seller's incentives are calculated.

III. PHASE II

A. Buyer/Government Funded Projects

In Phase II, funding for Subcontractor CRI projects will be negotiable on a project-by-project basis. Prior to funding of Phase II, the Seller shall include the expected level of investment necessary to implement the project in its capital budget planning process. This does not obligate the Seller to fund projects which thereafter are mutually agreed to be technically or financially infeasible.

B. Seller Funded Projects

1. Seller Projects

There will be cases in which the Buyer will be unable to provide funding for the CRI initiatives.

In the absence of Buyer funding, it is appropriate that rewards be increased equitably to provide enhanced incentives to the Seller to fund CRI projects.

It is agreed that factors such as costs, schedules, economic changes, program changes, and the like represent too uncertain a biassing affecting both parties to permit the establishment of binding standard methodology for the purposes of project proposals and negotiations. Therefore, project-by-project proposals in consonance with this MOU will be the basis for project definition and contractual definitization.

2. Subtier Projects

In the event Seller funds Phase II of projects at its Subtier Vendors, Seller shall be entitled to retain a portion of the flow-through cost savings resulting from the implemented technology. Seller is to perform an IRR Analysis to determine the PSR necessary to provide incentive for seller to fund the subtier vendors project.

C. Proposal

Seller project proposal shall be submitted prior to Phase II development providing the project statement of work, development schedule, and Seller's Phase II costs. ROM estimates shall be' included for Seller's planned Phase III implementation, investment, and resultant instant and future savings, with projected schedule of Seller's required PSR payments. No Phase II development activity shall be initiated until the project proposal has been negotiated and/or Buyer has issued contractual authorization to begin the work. Such authorization shall be an interim business agreement which shall be incorporated into the IMIP/CRI Purchase Order/Change Order.

D. CRI Purchase Order/Change Order Structure

1. Purchase Order

a. Prior to negotiating any project proposal pursuant to this MOU, the parties hereto shall agree to an umbrella contract for said projects. Buyer shall issue an CRI Purchase Order that contains general terms and conditions applicable to all said projects. Costs accumulated for each project shall be booked against the Purchase Order Task Line Item.

b. Each project negotiated in preparation for Phase II development shall then be issued as a Task Line Item to the CRI Purchase Order. Prior to the end of Phase II, the projects' final business agreement shall be incorporated into the Phase III CRI Purchase Order, including a schedule of PSR payments and any special provisions pertaining to the project. The procedure for payment of any PSR out of future contract savings shall be as set forth in paragraph IV.C. hereunder.

c. Upon definitization or exercise of option of a future production contract, the Seller shall invoice the Phase III CRI Purchase Order and Buyer shall pay the full amount of PSR owed for that Production contract, as scheduled in the Final Business Agreement. Any scheduled, but unpaid PSR shall be carried forward for payment from subsequent follow-on production contracts.

2. CRI Change Order

a. As appropriate, Buyer and Seller may enter into Phase III CRI Purchase Order as set forth above with a change order to the basic, instant Subcontract effecting the implementation (Phase III) of the individual projects; or

b. The Buyer and Seller may, as appropriate, incorporate all CRI terms, conditions, and agreements directly into the effected instant Subcontract without executing a Phase III CRI Purchase Order.

3. Profit

Profit or fee on Seller Phase II CRI projects will not be paid.

IV. PHASE III

A. Implementation Decision

If a project is financially acceptable as determined by the discounted cash flow model, and the level of capital required for implementation is within 120% of the amount negotiated at the completion of Phase II effort, the Seller shall implement the project. Buyer's Phase II funding for a project shall be refunded to Buyer should the Seller fail to implement that project if it is financially and technically feasible, and within the 120% investment ceiling.

The Seller agrees to invest in modern, cost-effective equipment required to implement CRI projects, and will fund 100% of capital expenditures and/or commercially available software for all projects.

B. Seller Implementation Proposal (SIP)

The Seller shall submit a Phase III Seller Implementation Proposal (SIP) to demonstrate that PSRs are required to make identified Subcontractor CRI project implementation economically viable and beneficial for the Seller, Buyer, and the Government. Supporting documentation shall include the following:

1. The Project Identification to consist of project description and implementation schedule, identification of capital equipment to be acquired, nomenclature, quantity, and cost of equipment. In addition, any development, installation, and validation costs or other expenses, whether or not capitalized, will be included in the SIP to the extent that these costs are not other- wise allocable to the performance of any specific DoD contracts;

2. A Cost/Benefit Analysis that will document the overall economic and other effects of the project identifying the anticipated reduction in price attributable to improvements resulting from project implementation. The analysis should address the following:

a. Estimates of costs incurred (if any) and to be incurred to develop and implement the project including direct and estimated allocable indirect costs. These estimates are to be provided separately for instant contracts and other contracts expected to benefit from the project;

b. Estimates of savings applicable to the instant contract and other contracts expected to benefit from the project; and

c. PSR Calculations An IRR Analysis will be completed to demonstrate the economic benefits provided by new projects relative to their

development and implementation costs. An analysis should be run including the PSR necessary (if any) to achieve a project's threshold. The CRI Discounted Cash Flow Model, capable of being run on an IBM PC (or compatible), will be used for this analysis.

C. PSR Payment Basis

1. Instant Subcontracts are defined as those Subcontracts already priced without incorporating CRI improvements. Operational milestones, as referred to below, are the implementation dates determined on a project-by-project basis and shall be contractually documented by the contractual amendment which definitizes the requirements contemplated by this paragraph.

2. The Seller will receive PSR incentive award at the point of cost reduction in order to achieve the negotiated threshold as determined in accordance with paragraph IV. B.2(c) above. The PSR can only be paid out of CRI realized cost avoidances.

   The instant Subcontract savings from each CRI project, where PSR is based on IRR, will result in a reduction of subcontract line item prices.

3. In any year, PSR payments required to attain the negotiated Project IRR will not exceed the savings projected on any affected instant contracts. Specific arrangements for PSR will be proposed and negotiated for each project proposal. The Buyer will allow payment of Seller PSR out of instant contract savings/cost avoidances. (If instant contract savings are not sufficient to pay all PSR, then the unpaid portion of the PSR will be paid as set forth in paragraph III. D.1.c. above.)

4. Upon achieving the operational milestone, the value of instant Subcontracts will be reduced, at the price line with no adjustment to profit, by the mutually agreed to amount of CRI instant Subcontract savings less the PSR required to achieve the negotiated threshold. Each project's PSR will be separately calculated and contractually noted.

5. If the instant Subcontract being adjusted due to CRI is an incentive type Subcontract, ceiling price will likewise be adjusted.

6. In the event other DoD Subcontracts are impacted by Subcontractor CRI projects performed under this MOU, the following procedures will apply:

   a. Instant other DoD Subcontracts - The Seller will estimate the savings on these Subcontracts which result from Buyer sponsored CRI projects. Upon agreement of these estimates, these savings will be included in the cash flow model as cash flows into the Seller. PSRs will be calculated in accordance therewith and administered accordingly.

   b. Future other DoD Subcontracts - Future other DoD Subcontracts benefitting from Buyer sponsored IMIP/CRI projects, must be priced taking the CRI improvements into account (IAW Public Law 87—653)

7. In the event of Subtier CRI projects, the following will apply:

   a. The incentive awards will be made by Buyer, through the Seller, to the Subtier Vendor. The Seller will negotiate the specific terms of the incentive awards with the Subtier Vendor subject to Buyer approval. Incentive awards will be made out of savings at the point of vendor

subcontract price reduction based upon the projected CRI project's operational milestone by the Subtier Vendor; and

b. The savings generated from the CRI project at the Subtier Vendor will be passed through the Seller to Buyer with the appropriate burdens. Future Subcontracts will be priced incorporating the results of CRI projects at the Subtier Vendor. Specific methods for estimating and determining savings at the Subtier Vendors will be negotiated by the Seller with its Subtier Vendors, subject to Buyer approval.

V. CURTAILMENT OR TERMINATION

A. Seller Projects

1. In the event it is mutually agreed by the parties to terminate a project in Phase II of same, the direct and indirect costs incurred will be reimbursed through increases in PSRs, on a dollar per dollar basis, of other projects upon definitization of a negotiated supplemental agreement.

2. Any CRI development costs which the Seller incurs pursuant to an executed CRI Purchase Order/Change Order may be recoverable in the event of curtailment or program termination. These costs shall be deemed allowable direct pre-termination/precurtailment costs and shall be paid promptly upon submittal of invoices for such costs.

B. Subtier Projects

Notwithstanding any provision of the CRI Purchase Order/Change Order or this MOU to the contrary, the Seller and participating Subtier Vendor shall, in the event of program curtailment or termination, pursuant to this MOU, be entitled to recover the following:

1. Accrued development costs and any allowable termination costs in accordance with the CRI Purchase Order terms and conditions. Termination costs shall be excluded from allowable costs considered in calculations of PSR.

2. Accrued PSR, limited to not-to-exceed project savings accrued to the date of curtailment or termination.

VI. TECHNOLOGY TRANSFER

A. As part of the prospective proposal submission for each phase of a particular project, the Seller shall identify the Limited Rights in Data to be used in the project which would restrict the transfer of project technology. The Seller shall make available to interested parties reports, demonstrations, and information facilitating the transfer of technology developed under a government-funded CRI project.

B. Security considerations and the Security Guide governing the Buyer's Program take precedence over technology transfer activities.

FOR THE SELLER:

_____

DATE: _____

FOR THE BUYER:

_____

DATE: _____

PRO FORMA

INTERIM BUSINESS AGREEMENT
COST REDUCTION INITIATIVE

TITLE

I. INTRODUCTION

This Interim Business Agreement (IBA) is entered into between (subcontractor) located at (address) _____ and the Northrop B-2 Division located at 8900 E. Washington Boulevard, Pico Rivera, California 90660 hereinafter referred to as the subcontractor and contractor, respectively.

This agreement describes the framework under which the subcontractor and the contractor agree to negotiate the Productivity Savings Reward (PSR) at the conclusion of the Phase II non-recurring development effort for the subject CRI. A Final Business Agreement (FBA) will be executed prior to proceeding with Phase III implementation effort.

II. FUNDING

A. The contractor hereby commits to fund up to a level of $_____ (then year dollars) on a firm-fixed-price basis for the Phase II design development and demonstration of this project _____. Furthermore, the parties agree that the contractor shall receive reimbursement of this funding and any applicable incentive payment from the subcontractor's instant and/or follow-on contract savings, as presented in Attachment 1 - PSR Calculation Documentation, prior to payment of an incentive to the subcontractor.

B. The subcontractor shall fund up to a level of $_____ (then year dollars) on a firm-fixed-price basis for the Phase II development and demonstration of this project. Furthermore, the parties agree that the contractor shall receive reimbursement of this funding and any applicable incentive payment from the subcontractor's instant and/or follow-on contract savings, as presented in Attachment 1 - PSR Calculation Documentation.

7. Comply with the CRI MOU paragraph V.A. and 1 and 2 for the indemnification coverage in the event the project is terminated or the program is curtailed or terminated.

D. The subcontractor agrees to the following:

1. Compliance with other terms and conditions of the CRI purchase order and all other provisions of this agreement.

2. Execute a certificate of current cost and pricing data in support of the firm fixed prices cited in paragraphs A and/or B.

E. Identification requirements for prototype and facilities equipment, and capital.

1. The following items shall be procured as prototypes Phase II development and remain property of the government.

Item No.	Nomenclature	Qty	Unit Price	Total Price

2. Any item(s) of facility or equipment must be verified as severable; non-real property and be within the definition of facilities as defined in FAR 45.301 or a Special Test Equipment as defined in FAR 52.245-18.

3. The following item(s) shall be purchased during Phase III as capital items and depreciated in accordance with the subcontractor's accounting practice

Item No.	Nomenclature	Qty	Unit Price	Total Price

III. PRODUCTIVITY SAVINGS REWARD

A. The following is the financial summary for this IBA:

ROM DoD Gross Savings $

Less: Phase II FFP
ROM Implementation Costs
ROM PSR

In addition, the subcontractor agrees to invest in modern, cost-effective manufacturing/engineering improvements (including, but not limited to capital equipment, software and related systems required to implement this project in Phase III) up to an estimated level of $_____ (then year dollars for capitalized and non-capitalized items/tasks). This investment is over and above normal capital investments necessary to support anticipated production requirements for DoD Programs, and is not intended to displace the level of investments that would normally be made to meet those anticipated production requirements. In addition, this investment is over and above the contractor's five-year capital investment plan in effect on_____. At the time the five-year capital investment plan is revised, this investment should be included.

C. In consideration for the contractor funding cited in paragraph A above and for the indemnification of Phase II cost contained in paragraph B against program or project (technical and financial infeasibility) termination, the subcontractor agrees to the following:

1. Perform all work required by the Statement of Work (SOW) dated _____, Attachment 2.

2. Provide acceptable results to both the Government and contractor from the design, development and demonstration of this CRI in accordance with the above SOW.

3. Execute a final business agreement based on a final cost benefit analysis prior to Phase III implementation.

4. Reduce the price of instant and follow-on contracts in accordance with the savings values presented in Attachment 1, at the execution of FBA.

5. In consideration for the subcontractor's investment in paragraph B above, the return on investment percent on this project shall not exceed _____. The calculation of this IRR type project is contained in the PSR Calculation Documentation, Attachment 1.

6. If the Government and/or Northrop is funding phase II costs and there are no significant Phase III costs, the subcontractor agrees that the PSR shall be calculated based on a percent share of net savings by fiscal year buy not to exceed _____ percent. The Government's and Northrop's costs and return on investment shall be reimbursed prior to any sharing of savings by the subcontractor.

ROM DoD Net Savings: $

ROM DoD Net Present Value: $

B. This financial summary is extracted from the Discounted Cash Flow (DCF) Model Schedule 1 Project Summary presented in Attachment 2.

C. The Cost Benefit Analysis (CBA), Attachment 4, presents the firm Phase II costs and ROM saving data that is the database for the DCF Model calculation for PSR. The CBA data and DCF model contents should correspond identically.

D. The contractual requirement for a final CBA, to be provided with the Phase III implementation proposal, shall be the basis for negotiation of the firm PSR based on actual Phase II costs, firm savings, firm implementation costs and firm capital acquisition costs.

E. PSR payment data and contract line item numbers shall be established in the Final Business Agreement. In any event, subcontractor PSR payments shall not exceed the net savings for that fiscal year buy in accordance with established criteria for share and IRR type projects.

IV. GROUND RULES AND ASSUMPTIONS

A. The following are ground rules and assumptions of this CRI project.

Release to manufacturing date _____

Completion of Phase II Implementation date _____

Air Vehicle Effectivity No. _____

FY-Buy Incorporation _____

BAM _____ Schedule

B. Other Unique Conditions

V. INTERIM BUSINESS AGREEMENT EXECUTION

The following company representatives certify by their signature that they are authorized by (subcontractor name) and Northrop B-2 Division to contractually bind their respective companies and hereby exercise that authority.

For (Subcontractor)	For Northrop B-2 Division
_____	_____
Typed Name	Typed Name
Title	Title

PRO FORMA

FINAL BUSINESS AGREEMENT
COST REDUCTION INITIATIVE

TITLE

I. INTRODUCTION

This Final Business Agreement (FBA) is entered into between (subcontractor) located at (address) _____ and the Northrop B-2 Division located at 8900 E. Washington Boulevard, Pico Rivera, California 90660, herein referred to as the subcontractor and contractor, respectively. This agreement documents the terms and conditions for the agreed to Productivity Savings Reward (PSR) as presented herein for Cost Reduction Initiative (CRI) (project title) _____.

II. FUNDING

A. The parties acknowledge that the contractor funded $_____ on a firm-fixed-price basis for the Phase II design, development and demonstration of this project. Furthermore, the parties agree that the contractor shall receive reimbursement of this funding and any applicable incentive payment from the subcontractor's instant and/or follow-on contract(s) savings, as presented in Attachment 1 PSR Calculation Documentation, prior to payment of an incentive to the subcontractor.

B. The parties acknowledge that the subcontractor funded $_____on a firm-fixed-price basis for the Phase II design, development and demonstration of this project.

In addition, the subcontractor shall purchase the following Phase III capital items and depreciate same in accordance with the subcontractor's accounting practices and the discounted cash flow (DCF) model presented in Attachment 1.

Item No.	Nomenclature	Qty	Unit Price	Total Price

(List equipment as applicable)

The subcontractor shall hold full title to the items of equipment acquired at its own expense and shall bear the risk of loss of destruction or damage thereto.

The subcontractor shall fund $_____ for the implementation of this project. Consideration for this implementation cost is reflected in the DCF model (either recovered through or incentivized by PSR).

C. In consideration for payment or establishment of PSR paid or owed to the subcontractor, the subcontractor agrees to the following:

1. Implement this project in accordance with the implementation plan and its schedule. (See Attachment 2 Implementation Plan.)

2. The subcontractor shall not be entitled to any PSR adjustment on the basis that the subcontractor implements the project late, or projects do not perform as estimated.

3. The instant contract(s) Fiscal Year Buy (19XX) shall be reduced from $_____ to $_____.

4. The contractor shall issue a change order that incorporates the new price and establishes instant contract(s) line item numbers for PSR payments as delineated below.

5. Follow-on contracts will be priced based on the "to-be" cost benefit data presented in Attachment 3, Final Costs Benefit Analysis.

6. Determine the analysis type (IRR vs. Share) for PSR calculation and exclude the other.

IRR - The final internal rate of return (IRR) on the subcontractor's investment for this project is _____ percent.

Share - The final percent share of net savings on this project is _____ percent and is payable within _____ days after definitization of the follow-on contract.

7. The executed Certificate of Current Cost and Pricing Data contained in Attachment 4 pertains to the implementation costs and the Final CBA which were the basis for establishing the negotiated savings and PSR.

8. Compliance with other terms and conditions of the CRI purchase order and all other provisions of this agreement.

9. The subcontractor warrants that on-going DoD Program schedules and

requirements shall not be delayed as a result of participation in the CRI Program. In addition, the subcontractor warrants that his ability to meet all DoD Program contractual specifications and performance criteria will not be degraded as a result of participation in the CRI.

III. PRODUCTIVITY SAVINGS REWARD

A. The following financial summary is extracted from the DCF model (Attachment 1) and its matching final CBA (Attachment 3).

DoD Firm Total Savings	$
Less: PSR Funder Cost	$
DoD Net Total Savings	$
DoD Net Present Value	$

B. The following matrix presents the agreed to summary of savings and PSR incentive requirements for this project by FY-Buy.

	FY '89	'90	'91	'92	'93	'94	'95	'96	'97	Totals
Gross Savings										
PSR Payments										
Net Savings										

IV. GROUND RULES AND ASSUMPTIONS

A. The following are ground rules and assumptions of this project:

BAM Schedule

B. Other unique conditions.

V. FINAL BUSINESS AGREEMENT EXECUTION

The following company representatives certify by their signature that they are authorized by (subcontractor name) _____ and Northrop B-2 Division to

contractually bind their respective companies and hereby exercise that authority.

For (Subcontractor)	For Northrop B–2 Division
_____	_____
Typed Name	Typed Name
Title	Title

NOTE:: The aforementioned attachments are not available at this time. Any questions regarding the attachments should be directed to the Northrop CRI Program Office.

GLOSSARY

GLOSSARY

baselining	The process of the principal parties establishing and agreeing upon the essential technical requirements, schedule, and cost information that serves as the basic foundation for the specific system.
buyer pools	A group of organizations that combine their dollar resources to purchase common specific items to obtain the lower unit costs that result from quantity discounts.
commercial applications	Commercial practices, methods, procedures, and off-the-shelf components and parts that can be purchased from private industry and require no further research and development work.
component breakout	The direct purchase of key, high dollar-value components by the government rather than the prime contractor largely to obtain lower costs.
computer-aided design	The use of computer software to provide interactive graphics for displaying and visualizing design work.
Computer-Aided Acquisition and Logistics Support	A DoD and industry strategy to develop highly automated and integrated information systems that produces necessary technical data in digital form for the design, manufacture, and support of DoD weapon systems.
computer-aided manufacturing	The use of computer technologies, including software to provide for planning, directing, and controlling production equipment used in the manufacturing process.
computer-integrated manufacturing	The one computer system within a plant that integrates all the automated manufacturing systems into a cohesive system.
concurrent engineering	The simultaneous accomplishment of the product design, manufacturing and support process design to establish a totally integrated process that maximizes efficiency and effectiveness.
contract requirements	The technical performance, schedule, and cost requirements specified within the contract to include the statement of work, contract terms and conditions, contract data requirements list, and referenced documents for specifications and standards.
cost commitment	Costs already incurred plus those estimated future costs that will occur because of decisions made today involving such items as operational and technical requirements, systems design, materiels, manufacturing processes, logistics policies, and quantities.

cost driver	A factor or condition whose occurrence causes costs to be incurred.
cost performance tradeoff	The process of evaluating alternative performance results in relationship to their associated costs.
cost savings	Actual decreases in existing contract costs and the avoidance of costs that result in lower costs or prices on future contracts.
design to cost	The process of designing a weapon system in such a way as to achieve specific unit cost objectives.
deviations	Government authorizations issued before manufacturing begins for products that allow for non-compliance with specific contractual specifications and standards upon government inspection and acceptance.
dual-sourcing	A form of competitive procurement whereby a second contractor is invited to bid against the primary supplier to produce part of the quantities being bought in a particular time period.
economic production rates	The quantities to be produced in a given time period for a specific manufacturer(s) that results in the lowest unit cost for the product.
experimental design	The use of statistical methods to incorporate a number of significant factors collectively in the design process.
expenditures	Outlays of funds represented by the actual cash or check payments made for goods and services received.
Industrial Modernization Improvement Program	A joint government and industry effort to improve the productivity of prime contractors, subcontractors, and suppliers by encouraging contractor financing of capital investments that improve production efficiency and effectiveness and reduce costs.
incentive contracts	Contracts that provide the opportunity for increased contractor profit based upon performance against some pre-established criteria.
leader/follower	An acquisition technique that provides a framework for competition by having the developer or sole producer of a system (the leader) provide the necessary manufacturing technology and know-how to a designated second-source contractor (the follower). The two contractors then usually compete for a share of the production buy.
life-cycle costs	All research and development, production and construction, operation and support, and retirement and disposal costs related to the entire life of a system or product from inception to abandonment.
maintainability	A design characteristic that reflects the ease, accuracy, safety and efficiency in the performance of the maintenance function.

Manufacturing Technology Program	The total of all DoD investments for developing new information that can be used to define, monitor, or control manufacturing processes and equipment.
multiyear procurement	The commitment in the first year to purchase the entire quantity of a specific weapon system over a designated number of years, although individual quantities and funding will continue to be authorized and appropriated on an annual basis.
operational requirements	End-user needs to satisfy specific military missions and serve as the basis for developing and specifying the contractual requirements.
performance requirements	The technical operational characteristics necessary to meet the user's operational requirements.
Preplanned Product Improvement	The process of purposely designing a system to satisfy current requirements while providing the capability to easily change the system over time to accommodate new and future requirements.
producibility	A design of the manufacturing processes to describe the relative ease of producing an output that promotes the economical use of materiels, labor, and production processes using available technology.
prototyping	The development, construction, and testing of working models of specific systems to assess design, technical performance, and cost prior to proceeding with Full-Scale Development.
reliability	A design characteristic that reflects the probability that a given system or product will operate satisfactorily under specific conditions for a particular period of time.
request for proposals	The government's written invitation to private industry to submit bids or proposals to satisfy designated requirements and to produce a specific system.
rework/repair	The process of bringing a substandard manufacturing part up to standard.
schedule	The degree to which actual schedule results meet planned results and can be measured by comparing the amount of acceptable output to scheduled output at the prescribed delivery date.
scrap	The unusable portion of any manufactured output.
scrub	The process of reducing or eliminating non-essential requirements and work.
Should Cost	An approach to contract pricing based on the use of a government team of functional and program experts who review, assess and develop recommendations to improve contractor operations and reduce costs.
specifications and standards	The specific requirements for purchased materiel, processes, procedures, and data that are formally incorporated into official federal and DoD documents.

Statistical Process Control	A scientific method for identifying and correcting deviations in the manufacturing process on a real time basis through statistical sampling and operator-directed actions.
streamlining	Any action designed for more efficient and effective use of resources in the research, development, acquisition, and deployment of DoD weapon systems.
subcontract management	The relationship between the prime contractor and its supporting subcontractors that the government can influence through consent procedures, flowdown of requirements, and any particular management visibility specified in the prime contract.
supportability	A design characteristic that involves several different but related elements of system and product support, including maintenance, supply, personnel and training, test and support equipment, facilities, transportation, and data.
tailoring	The process of evaluating standard type requirements in relationship to specific weapon systems, subsystems, components, and parts to obtain the optimum mix of need and cost.
teaming	An acquisition technique where groups of two or more contractors form a team to compete typically for design selection and award of the Full-Scale Development contract. Members of the winning team then compete for specified shares of the production buy.
technical data package	Specifications/standards, including drawings, the statement of work and the contract data requirements list.
tiering	The layering of specification and standards references, one on top of another. For example, the contract specifications may reference other documents, which for the initial layering, is defined as the first tier. If the first tier, in turn, references additional documents, these become the second tier, and so on.
Total Quality Management	An organization-wide management process aimed at continuously improving all organizational operations to achieve high quality, increased productivity, and lower costs.
Value Engineering (VE)	An organized effort to analyze and assess the functions of systems, equipment, services, and supplies to achieve the lowest cost without sacrificing technical performance, quality or schedule.
waivers	Government authorizations issued after manufacturing begins that allow for non-compliance with specific contractual standards or specifications upon government inspection and acceptance.
warranty	An implied or expressed (formal) type of guarantee that establishes the seller's responsibility for product repair or replacement resulting from specified failures of materiels, services, or data during a specific period.

yield	The relationship of input to output of a given item in the manufacturing process.

ABBREVIATIONS

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AAP	Army Ammunition Plant
AAWS-M	Anti-Armor Weapon System-Medium
ABA	Activity Base Accounting
AMC	Army Material Command
AVSCOM	Army Aviation Systems Command
BP	Brilliant Pebbles
C/SCSC	cost/schedule control systems criteria
CAD	computer-aided design
CALS	Computer-Aided Acquisition and Logistics Support
CAM	computer-aided manufacturing
CD	Concept Definition
CFV	Cavalry Fighting Vehicle
CIM	computer-integrated manufacturing
CLU	command and launch unit
CPAF	cost plus award fee
CPIF	cost plus incentive fee
CRI	cost-reduction initiatives
CRS	cost-reduction strategy
DCAA	Defense Contract Audit Agency
DEM/VAL	Demonstration/Validation
DoD	Department of Defense
DSMS	Defense Systems Management College
DTC	design to cost
ECP	Engineering Change Proposal
FAR	Federal Acquisition Regulation
FPIF	fixed price incentive fee
FSD	Full-Scale Development
FVS	Fighting Vehicle Systems
GE	General Electric
GOCO	government-owned, contractor-operated
IDA	Institute for Defense Analyses

IFV	Infantry Fighting Vehicle
IMIP	Industrial Modernization Improvement Program
JIT	just in time
LRIP	low-rate initial production
MANTECH	Manufacturing Technology Program
MDHC	McDonnell Douglas Helicopter Corporation
MICOM	Missile Command
MOU	memorandum of understanding
MYP	multiyear procurement
NAVPRO	Navy Plant Responsibility Office
NLT	not less than
OSD	Office of the Secretary of Defense
PM	program manager
PO	program office
PPBS	Planning, Programming and Budgeting System
RFP	request for proposals
SAR	Selected Acquisition Report
SDIO	Strategic Defense Initiative Organization
SDS	Strategic Defense System
SLBM	submarine-launched ballistic missile
SPO	Systems Program Office
SSEB	Source Selection Evaluation Board
SSPO	Strategic Systems Program Office
TACOM	Tank-Automotive Command
TADS/PNVS	Target Acquisition Designation Sight/Pilot Night Vision Sensor
TI	Texas Instruments
TOW	tube-launched, optically-tracked, wire-guided
TQM	Total Quality Management
VE	Value Engineering